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Psychology in Education

BY HERBERT SORENSEN

University of Kentucky

SECOND EDITION

New York Toronto London

McGRAW-HILL BOOK COMPANY, INC.

1948

1 091 048

PSYCHOLOGY IN EDUCATION

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PREFACE TO THE SECOND EDITION

In preparing the second edition of this textbook in educational psychology, the author has tried to utilize the experiences of the users of the first edition. Suggestions and criticisms received by the author have guided him in preparing this second edition. For this help, gratitude and appreciation are expressed.

Much of the first edition has been completely rewritten, some material omitted entirely, and new material added. The remainder, with the exception of a few pages, has been carefully revised. A chapter on the mental health of the teacher and one on basic motives have been added.

The emphasis and orientation of the second edition is essentially the same as that of the first. The guidance, motivation, growth, development, and learning of the pupil constitute the basic areas and elements for emphasis. Discussion is not restricted to mental or intellectual elements or factors but includes extended discussion of the physical, emotional, and social development of the pupil and student. The various phases of growth and development are dealt with not as isolated lines or directions of development but rather as integrated patterns.

The students who study this book will soon be teachers and then will experience many relationships with their pupils. In this second edition greater stress has been placed on the professional and personal characteristics of the teacher and how they influence the responses of his pupils. The interaction of teacher and pupil with consequent effects on the motivation, guidance, growth, and adjustment is always pointed out and discussed.

The author wishes to acknowledge the help he has received from the research and writings of many workers in the fields of education, psychology, sociology, and the biological sciences. He also expresses his appreciation for the permissions granted by publishers to use some of their material.

Throughout this text consistent attempt has been made to integrate the factors and problems of growth and development, motivation, guidance, personality and emotional life, capacity, individual differences, learning, achievement, and personal adjustment. It is hoped that this second edition will prove helpful to teachers and prospective teachers both personally and professionally and will help them to guide and motivate their pupils to achieve the fullest possible development.

HERBERT SORENSEN

LEXINGTON, Ky.

November, 1948

PREFACE TO THE FIRST EDITION

The major objective of the writer was to produce a volume that would contain and interpret the fundamental psychological facts, principles, and theories applying to education. Because the education of pupils is much more than the learning of subject matter, the contents of this text concerns itself with the fuller problem of pupil adjustment. Methods of effective learning demand the serious and devoted attention of the educational psychologist, but so also do the problems of growth, emotional reactions, behavior, and personality of pupils, capacity to learn, measuring and marking achievement, and the extent to which pupils' abilities and characteristics can be and are determined by hereditary and environmental forces.

Considerable emphasis is placed on growth, development, and adjustment, as evidenced by the chapters and sections on physical growth, social growth, mental growth, and the emotional life and adjustment of the pupil. The interrelationship of these phases of growth is pointed out, and the educational importance of the increase with age in capacity to learn from natural growth is emphasized. Stress is laid on the emotional reactions and personal adjustment of the pupil, so that the teacher in his effort to stimulate his pupils to learn subject matter will not overlook the pupil, with his feelings, emotions, and personal problems.

A prominent place is given to the problems of learning. Consequently, several chapters are devoted to the capacity to learn, the principles of learning, factors influencing learning, methods of studying effectively, transfer of training, and methods of teaching. In this connection, the measuring and marking of pupils' learning and achievement are also discussed.

On the topic of nature and nurture, the author takes a divided point of view. In some respects, he is a rank hereditarian, believing, for example, that extremes in capacity, particularly the highest, are determined almost entirely by heredity. On the other hand, he believes that people's attitudes, points of view, and beliefs are acquired. The capacity for learning academic material is probably fixed within fairly narrow limits by nature, but the health of children, especially in infancy, depends for the great majority on the care that they receive. All in all, the evidence indicates that both nature and nurture are extremely important and that we should make the most of each.

This book is not written as representative of any school of psychology. Not being a doctrinaire, the author has tried to utilize the experimental work from the sources applicable to the problem of education. No psychologist of any school is entirely wrong or entirely right. It probably is best in an elementary textbook to keep free from controversy and avoid extremes, making use of all the psychology that will contribute to the improvement of the educational process.

An attempt has been made in discussing the problems to orient the pupil as completely as possible and to bring out many implications from the discussion. The author is opposed to narrow, arbitrary teachers whose methods are formal and consist largely of questions and answers, drill and review; on the other hand, he favors education that takes into account both child and subject matter, in which teaching methods are varied, where meaning is developed, and where the pupils live in a greatly enriched environment.

The author takes pleasure in acknowledging his indebtedness to a number of persons. First of all, it should be said that the greatest indebtedness is almost always to those workers who have reported their experimentation in their books and in the professional magazines. May he thank, especially, however, his present colleague Dr. Charles Saltus for reading the manuscript critically. May he also express his appreciation to a former teacher, Prof. W. S. Miller, for whom he was office boy in his days as a graduate student; the author hopes that this book will show at least a little fruit from his indoctrination. He will surely recognize some of his very statements and experiences. The author is happy to acknowledge here also the extensive help that he received from his wife, who assisted materially by reading the manuscript and caring for innumerable details.

HERBERT SORENSEN

DULUTH, MINN.

May, 1940

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EDITOR'S INTRODUCTION

Modern educational psychology began with a study of learning as a process, but from the very moment of its birth it began to pass more and more to a study of the learner himself as a person. Unable to forget completely its brass-instrument and statistical-technique ancestry, however, it stoutly resisted following its true destiny. Psychologists found at once that they could not study learning scientifically without also studying all the conditions under which learning is done and that the person who is doing the learning is his own chief condition of learning. They found that his growth and development must be investigated and all his traits and qualities assessed in relation to the time and place of their appearance and use if a study of learning was to be more than a mere academic exercise.

The resultant job of educational psychology is one of central importance in the education of teachers. No professional subject has properly had so great a role. It is painful to have to add that none has so often missed playing its role up to the level of its importance. Like a wayward child, secure in the affections of doting parents, it has sometimes swaggered along its own road without much regard to the way being followed by professional education in general. Educational psychology was recognized as a fundamental subject in the preparation of teachers—the fundamental subject to many administrators of teacher-training institutions. It was therefore so secure that it did not have to contribute too specifically to the education of individual teachers. It was not required to pay its full way in the coin of actually helping teachers practice their everyday craft more skilfully and significantly. This payment was required only of plebeian subjects like curriculum construction, methods of teaching, and supervision. Educational psychology belonged to the aristocracy of subjects that were good for their own sake. A magic aura of respectability and technical scholarship tended to settle about its head and protect it from the winds of harsh criticism.

This protected status has been bad for educational psychology. In many colleges and universities it has thus too frequently become a subject somewhat apart from the general current of the professional preparation of teachers. Dealing with the central element of education, it should be in the heart of the professional curriculum. Instead, too often, it nestles in an academic corner, chewing the bones of its own digging,

a living testimonial to the truth that a mere place, even a place of highest rank, in a curriculum is not enough.

It is not a place on a floor plan or a share of the required semester hours that educational psychology or any other subject in the professional curriculum needs; it is rather a position on the team that is vital to the significance of any subject in a program of teacher education.

How educational psychology is going to be used in the education of teachers in any college or university depends on much more than a textbook. It depends on the cooperation of all departments concerned with the preparation of teachers. That the textbook may help or hinder in the process of putting educational psychology at the heart of the teacher-education program is undeniable.

The present volume is recommended as one which is particularly useful for a team job. The author has learned by long experience as a teacher and administrator in college and university the crucial nature and the technical details of putting educational psychology into functional operation as an integral part of a teacher-education program. He has revised and extended a book that for a decade has been used successfully in such programs. The publishers and the editor offer it to the profession with confidence that it will continue to help make the task of preparing teachers become more and more a team job of the highest social and intellectual quality.

HAROLD BENJAMIN

UNIVERSITY OF MARYLAND

November, 1948

CHAPTER I

HUMAN PHYSICAL GROWTH AND DEVELOPMENT

What to Look For. Study carefully the course of human growth in terms of pounds and inches. Note that there are four quite distinct phases of growth.

What account should be taken, in terms of healthful living, of weight in relation to age and height?

What account should be taken of growth in adjusting both academic and physical-education programs?

What change in the proportion of the head, torso, legs, and arms takes place with growth from infancy to adulthood?

How can the factors of nutrition, exercise, and fatigue be balanced in relation to growth so that the child will achieve the most healthful development? How can athletics be either healthful or detrimental?

Study the course of growth of the brain, the body as a whole, the genital system, and the lymphoid system, and relate this growth to personal, social, and educational development.

Two terms, *puberty* and *adolescence*, are used. What do they mean, and what ages are involved?

Physique has a considerable effect on personality, and the reader should understand how this influence operates. How can the individual achieve the physical development that is best for him?

What is the relationship between intelligence and physical size and between personal and physical characteristics?

The growth of abilities in sports and of the ability to do physical work accompanies increase in age up to maturity. Be able to explain.

Boys and girls differ in their physical development, and this difference affects behavior. Explain.

Do you think that there is a general motor ability that functions in all activities such as athletics and working with tools of various kinds?

What should be done about left-handedness?

Introduction. "Where were we and what were we before we were conceived and born?" asked Wilbur in a discussion that was taking place in a group of high-school students.

"I am more interested in the great changes that have taken place

in us as we grew older. For example, what happens to the brains of young children as they grow older?" contributed Clarence.

Then Ray suggested, "Maybe our many interests in life, like our interest in games, in our jobs, in the other sex, and in what we read, are controlled by the stage of growth we have reached."

"I was interested in what the coach said about Fred, who is in the eighth grade. He said that Fred would be a fine ball player in a couple of years after he had grown bigger and stronger."

"Good physical development and good carriage contribute to a good personality," said Bill. "If a fellow has a good appearance, it makes him more confident and he feels more secure."

"If it doesn't make him conceited," interjected Marian as she looked into the room where the boys were talking. Marian was Bill's sister and two years younger.

The boys told Marian that their discussion wasn't for women. Marian, having had her say, went on her way, and the boys turned to something else.

Growth before and following Birth. Life begins with the union of two germ cells, the male sperm and the female ovum. The germ cell of the father fertilizes the germ cell of the mother, and a new life is on its way. From the union of these two cellular specks a new and hitherto unknown human being begins his growth in the body of his mother. Nine months is the normal prenatal period. At its beginning there is rapid multiplication of the original weight, but this is so small originally that only during the last 2 or 3 months does the fetus gain rapidly in ounces and pounds. At birth, girls weigh about 7 pounds on the average and boys about $7\frac{1}{2}$ pounds.

This growth and development of a human being from the union of two germ cells is the most fascinating and stirring drama that comes within the experience of mankind. From the seemingly unknown, through the embryonic and fetal period, the unconscious beginnings of infancy, and the period of childhood; through adolescence with the changes that bring on maturity, to the prime of life, and then to the period of progressive deterioration, with many dropping out along the way; then old age for many, and finally death—all this is the certain march from conception to the end of life. Life and living, the human being and his reactions to his environment transcend in drama and in the ability to captivate the imagination the wizardry of electricity or the mysteries of the atomic bomb.

Why Study Growth and Development. The student may inquire about the reason for studying growth and development and why a

book on educational psychology should begin with a chapter on this topic. Psychology is primarily a study of human characteristics and human behavior. Educational psychology is the study of human characteristics and behavior applied to education and its problems. It is essential that any student of educational psychology understand how the human being grows and develops in order to understand his behavior. The educator must realize that he cannot understand health and physical education, the problems of learning and teaching, personality and social development without studying what the human being is made of and how he grows and matures.

These various relationships will be discussed in this and subsequent chapters.

General Growth of the Human Being. General growth is measured in inches and pounds. On the average, at birth a child is about 20 inches in height and between 7 and 8 pounds in weight, boys being slightly taller and heavier. During the first year there is rapid increase in both height and weight. Growth in the second year is also rapid, but considerably less so than during the first. The weight of a child doubles in the first 6 months and triples in the first year. During the first year the height increases 50 per cent. There is a steady and slower growth from the third year to the time of the adolescent spurt, which begins on the average at about the age of eleven or twelve for girls and twelve or thirteen for boys. Up to the time of puberty, boys are slightly taller and heavier than girls. But girls reach puberty about a year or two earlier than boys do and then for about 3 or 4 years, from age eleven to fourteen or fifteen, are slightly taller and heavier. At fourteen or fifteen, however, boys grow faster than girls. When maturity is reached, young men are about 5 feet 8 inches tall on the average and young women about 5 feet 4 inches. Boys weigh about 150 pounds at the age of twenty and girls about 125 pounds. Thus young men are about 4 inches taller than girls and about 20 to 25 pounds heavier on the average.

It should be kept in mind that we are speaking of averages and that there is wide range in height and weight for each sex, some being very short and some very tall, some very heavy and some very light. Big girls and women are larger than average men, and both average and large women are larger than small men. Men range in height from the little dwarfs or Tom Thumbs, who are nearly 2 feet tall, to the big side-show giants, who have reached the maximum height of about 8½ feet. In weight the range is from the small "human skeleton" to the circus fat man or woman. The maximum weight reached by a

man is about 1,000 pounds and by a woman about 800 pounds. It is interesting to note that in terms of height or weight per inch the heaviest

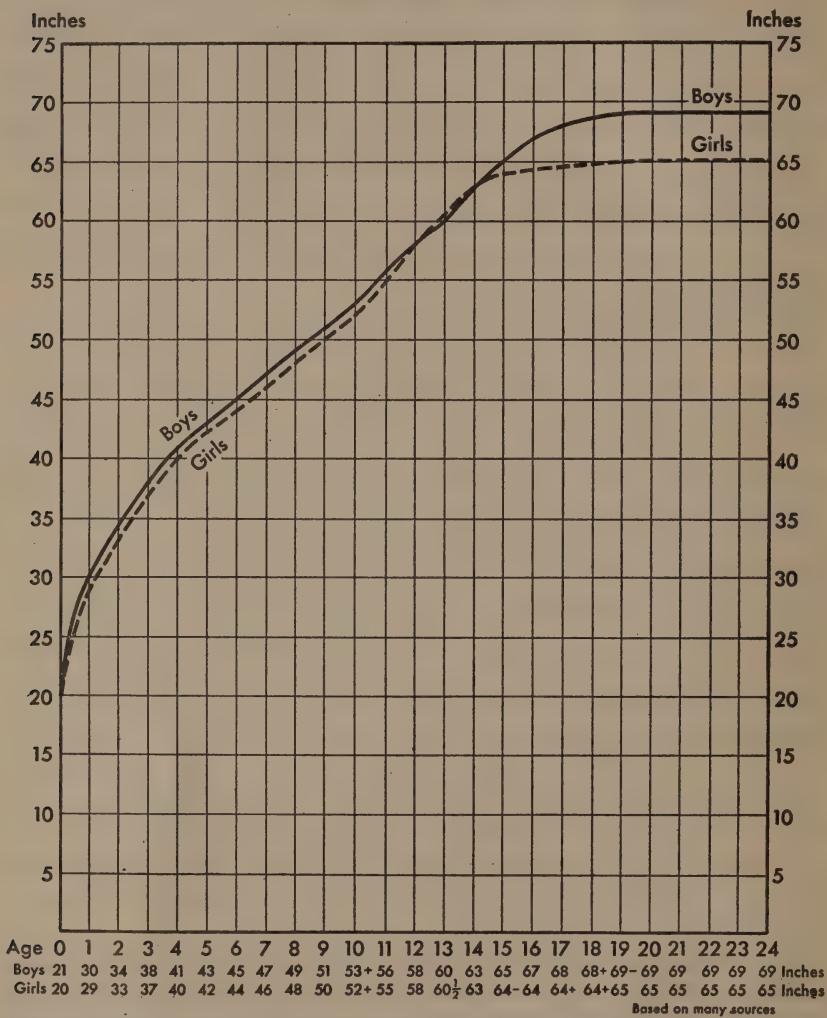


FIG. 1. Height of boys and girls from birth to maturity. (From Sorenson and Malm, *Psychology for Living*, McGraw-Hill Book Company, Inc., New York, 1948.)

woman on record weighed more per inch of height than the heaviest man.

In spite of this great range in height and weight the fact is that most children and adults fall within 4 or 5 inches of the average height and

within 15 or 20 pounds of the average weight for their age and sex. Most people are at or near the average, and as the distance from the

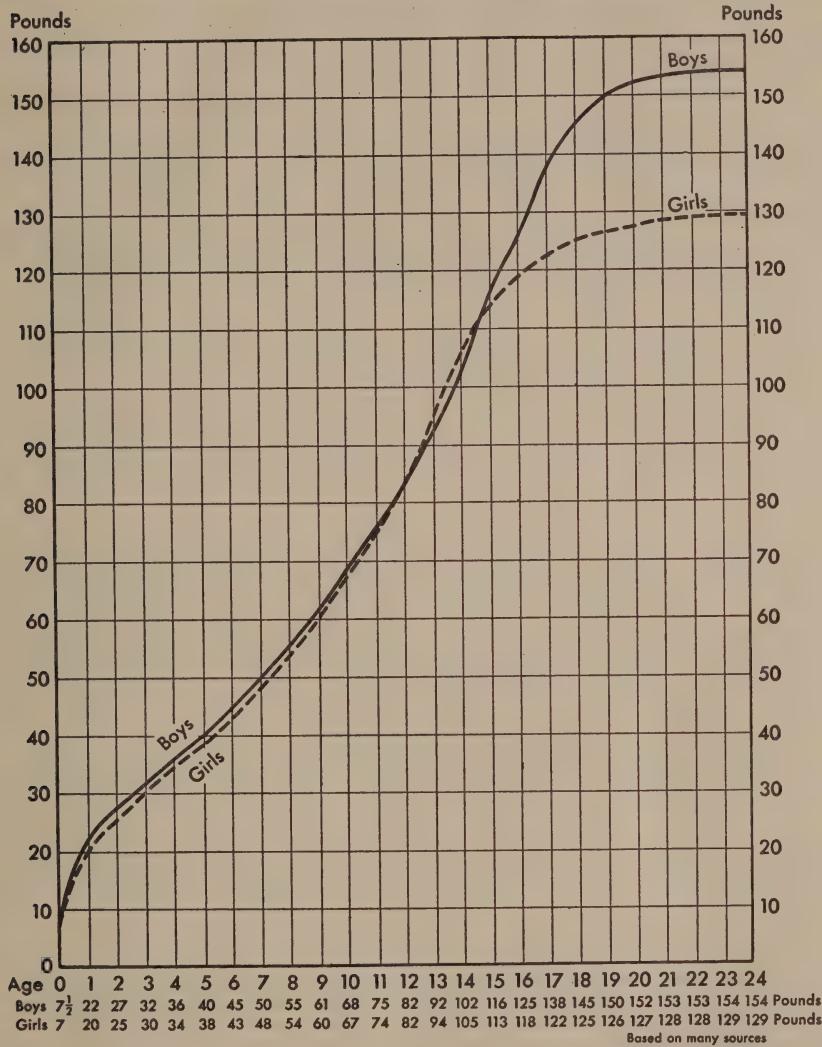


FIG. 2. Weight of boys and girls from birth to maturity. (From Sorenson and Malm, *Psychology for Living*, McGraw-Hill Book Company, Inc., New York, 1948.)

average increases the number at those weights and heights decreases.

Age, Height, Weight, and Health. Among children there is an increase in height and weight with age; but the course of growth is

not the same for all children, and they differ greatly in height and weight at a given age. The weight of any child is largely in terms of his height regardless of age, although it is expected, for example, that a child of ten of the same height as one of seven will be a little heavier than the seven-year-old.

For each age and height there are standards of weight, which should be available in every school and to every teacher. There is no true average for any child of a given age and height; but if a child is in the lightest 10 or 15 per cent or in the heaviest 10 or 15 per cent for his height, he should be carefully examined by a doctor to ascertain the condition of his health and to plan for increasing or reducing his weight as required. Ordinarily, the very thin or the very fat will experience an improvement in health from being brought nearer the average, though it may be found that some children are "naturally" thin or "naturally" fat and therefore already in good health.

The teacher should observe the thin and the fat in order to determine whether or not the physical condition of such children affects their personalities. Clearly, both physical and mental health may be involved.

Up to the age of thirty, being a little above the average in weight is ordinarily associated with better digestion and greater resistance to colds and tuberculosis. After the age of thirty, it is probably more healthful to be slightly under the average in weight. From the standpoint of physical and mental health, as well as of aesthetics, adolescent girls and those in their twenties are making a mistake when they eat sparingly in an attempt to substitute angles for curves.

Changes during Growth and Education. Physical growth from birth to maturity is accompanied by changes that cause a child six years of age to be different from a child of two and a person at eighteen to be very different from a child of twelve. Physical changes have taken place that produce changes in what a person is interested in and what he can do.

One of the changes that take place with increasing age is the maturing of the brain and the whole nervous system. The muscles have grown larger and reach their full maturity in early manhood and womanhood. The skeleton has become larger, and the joints of the bones have matured. They have become hard, or, technically, ossified. The glands of the body such as the thyroid, thymus, and sex glands and the organs such as the lungs, heart, and stomach have changed, also.

All this maturation and development is taken into account by the wise educator. In teaching school subjects, we allow for the difficulty

of the subject and the stage of mental maturation of a child's nervous system. For example, if children of the first grade are not ready to read from books, we give them useful experiences and wait until they are a year or two older, when we shall discover that they are mentally ready because their brains have grown and developed through the mere fact of having become older.

Physical education, too, takes into account the course of growth and development. In the first place, we should be most concerned about a program of health and physical education for the young child. Health and physical education are important at all stages of life, it is true, but more so during the first 10 years of life than the second 10 years, and during the first 5 years than the second 5 years. The nearer the beginning of life, the more important are good nutrition, good medical and dental care, play and exercise. As our schools now carry out their health and physical-education courses, the emphasis is placed on athletics and physical education during the second half of high school rather than during early childhood. By the time of the junior and senior years of high school, most growth has taken place; it is a period of rounding off into maturity and adulthood. At this time, games and play, health and physical education do less good than when a child is in the beginning phases of his growth. We can say, "The die is being cast," "As the twig is bent," "A good start is essential" when we think of health in connection with the beginning period of physical growth and development. Consequently, in planning our health and physical-education program, we should cooperate closely with Nature and do more for the child's health and physical well-being at the beginning of his growing period than we now do. The idea of taking advantage of the formative period of life applies particularly to health and physical education.

The period of the adolescent spurt, which varies with individuals but takes place for most between the ages of eleven and seventeen, should receive emphasis in any program of physical education. This is a period when bones are growing and developing at a rapid rate and should be regarded in importance along with the earlier periods of life.

Change in Body Proportion. An adult is not merely a child grown to adult size. Infants, children, adolescents, and adults differ in their body proportions. At birth the head constitutes about one-fourth the length, or height, of the human body. Never again is it proportionately so large. At maturity it is only one-eighth the total height, or only one-half as large as at birth. The torso is three-eighths the body height at birth and maintains this proportion in adulthood. The legs are

comparatively short at birth, being only about three-eighths the total height, but in adulthood they are one-half the total height.

Thus, as the child grows older, the proportion of the head decreases and the proportion of the legs increases correspondingly. All the body parts, head, torso, and legs, grow larger, of course, but the legs grow comparatively faster than the head. The arms also become proportionately longer in adulthood.

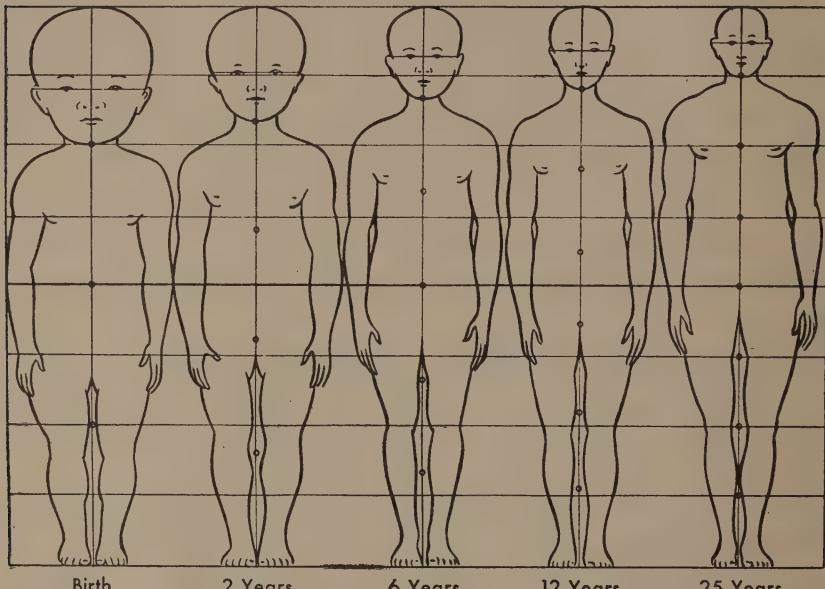


FIG. 3. Change in body proportion from birth to twenty-five years. (*Adapted from Ciba Symposia, Vol. 5, April-May, 1943, after Stratz.*)

The adult body is better adapted to the demands made upon it than it would be if it were that of an infant grown to adult size. The adult legs are better adapted to locomotion, for getting about, and for supporting the rest of the body. Think of the handicaps that the adult would suffer if the legs were as small and short relatively as they are in infancy. The adult would be greatly handicapped in maintaining his balance and in moving about with agility.

The arms, too, become comparatively longer and stronger in adulthood. This is as it should be, because of the need for the hands and arms in doing our work. The hands and arms are used during every waking hour.

It has been predicted that hundreds and thousands of years from

now our legs and arms will be shorter and more poorly developed than they now are. This prediction is based on the extensive use of automobiles and other conveyances and also the increasing development of laborsaving devices, which result in much less use of both arms and legs. There is little to be worried about, however, for the extensive participation in play and games is likely to maintain the present improved body structure of the adult.

It has been predicted also that we shall become large-headed because we shall be more and more mental and less and less physical. Possibly the adult physical type will be like what our type is now at birth, with large head and short legs. Most probably the stomach section will be smaller, for we shall live on refined foods, which will have less bulk than present-day foods. All this is interesting to contemplate, and we probably can obtain comfort in the thought that our body throughout the great future will continue to adapt itself so that it will be a better and better body for the environment in which it finds itself.

The musculature of the body increases from about 25 per cent of the total weight in infancy to about 45 per cent in adulthood. The skeletal structure grows with the body as a whole and is 15 to 20 per cent of the weight from infancy to adulthood. Much of the development in the bones takes place during adolescence, another condition that places great responsibility on the health and physical-education program of the home and school.

Figure 3 shows the changes in body proportion that have been discussed. By comparing the human body at the different ages, the phase of human development pertaining to comparative growth of the different parts can be more readily understood.

Growth and Development. Ordinarily, the term *growth* refers to increase caused by becoming larger and heavier. We speak of growth of the muscles, growth of the brain, growth of the skeleton, and growth of the body in general. We usually measure growth in inches and in pounds.

Development is related to growth but indicates more specifically the change in character that takes place. Bones, for example, grow and become larger, but they also develop by changing their composition and becoming harder. The skull grows from infancy, but it also develops by filling over the "soft spot," the fontanel. At birth, a child is born with the number of his brain cells determined. These grow larger, but they also develop by undergoing chemical change and by the formation of the medullary sheaths.

Thus a child not only grows into manhood but develops, also.

Furthermore, the bodily parts change their sizes relative to each other. The head becomes proportionately smaller as children grow older, and the muscles become proportionally a larger part of the body. Internal changes take place with the increase in the activity of some glands, such as the sex glands; and decrease in the activity of others, such as the pineal and thymus. Changes of this kind constitute development and in turn influence it.

Growth, Nutrition, Exercise, and Fatigue. The period of growth is associated with great energy and activity. The child and the adolescent are in motion throughout most of the waking hours. It is healthful for young people to be physically active. Exercise and activity contribute to their growth and health.

Still, a child, or teen-ager, or person of any age, for that matter, should not be so active and exercise so much that fatigue tends to become chronic. It is well to exercise to the point at which one is wholesomely tired if he then gets a good rest or a good sleep. But being "dead tired" much of the time is serious. The personality tends to become dulled by fatigue; one tends to droop in physical appearance. A person in this condition does not think so well, and he is likely to have less resistance to disease.

Good nutrition is a strong antidote to fatigue and a friendly ally of physical "pep" and growth. Milk, meat, and potatoes, eggs, vegetables, and fruits, coarse grain breads and butter, rather than "cokes," coffee, candy, "hot dogs," sirups, and cakes will do much to make a person feel well.

A good diet tends to leave a child less nervous and in a more stable condition so that he can respond more effectively to his environment. An experiment was conducted by Laird and others to test the effect of drinking milk, which, for one group of children, contained a pleasant-tasting concentrate of calcium, phosphorus, maltose, and lactose. In this experiment, conducted for children from the first, third, and fifth grades, at 9:30 A.M. some children received milk only, some received milk plus the food concentrate that has been described, and some were not fed. The pupils were rated by teachers at the beginning and end of a 2-week period for worry, emotional calmness, temper, criticalness, excitability, and other characteristics. It was discovered that there was about an 8 per cent improvement among those who were given the milk and a 16 per cent improvement among those given both milk and the food concentrate. There were, of course, individual differences in improvement, some showing much greater change than others.

In such an experiment as this, which covered only a short period

of time and involved a rating scale, there is certain to be a considerable degree of unreliability. Still, one can place some faith in the general trend and conclude that, if a little supplementary feeding in the middle of the morning causes children to be less nervous and more stable, we have an index at least to what effect scientific feeding based on an ample diet will have on the health and personality of growing children and even of adults, for that matter.

A word should be said about junior high-school and senior high-school athletics and health. If athletics for boys and girls between the ages of twelve and eighteen, which are the ages of junior and senior high-school pupils, are not carefully controlled, they can be harmful. Competitive sports may be too severe for teen-age boys, who are at the formative and rapidly growing ages. The heart of a teen-age boy is still comparatively small in terms of its ultimate development, and the strain imposed on it by strenuous and fatiguing sports may do injury in some cases.

We can say arbitrarily that junior high-school youngsters should not play as heavy a schedule of competitive games of football and basketball as senior high-school boys do. Even in the case of senior high-school boys, there is a well-grounded suspicion that competitive football and long, crowded schedules of basketball are not good for physical growth and development. The highly competitive organization of basketball in most districts, regions, and states keeps boys playing often and hard, possibly too hard. Adolescent boys are not physically mature or at their prime. The age of physical maturity and the greatest physical power and skill is reached some time in the twenties, from twenty-two to twenty-eight.

It is possible to minimize the unhealthy effects of strenuous high-school athletics by intelligent guidance and coaching. The modern, well-trained coach pays special attention to the welfare of his boys. He builds them up gradually so that they will be conditioned for strenuous play; he checks on their weight and demands that they "keep training" and live healthfully; he uses substitutes and does what he can to minimize the bad effects of overstrenuous high-school sports.

In many high schools, a program of health and physical education is crowded out by the time and money spent on basketball and football. Money is spent for a coach, not for a teacher of health and physical education. The coach devotes his attention to boys who play football and basketball, usually already the strongest and healthiest in the school. The result is that the great majority of boys and girls who

need health and physical education do not get it. This is not good for the personal and physical development of the students.

Growth of the Body and Some of Its Parts. Another aid to understanding the social and educational problems of human beings is a

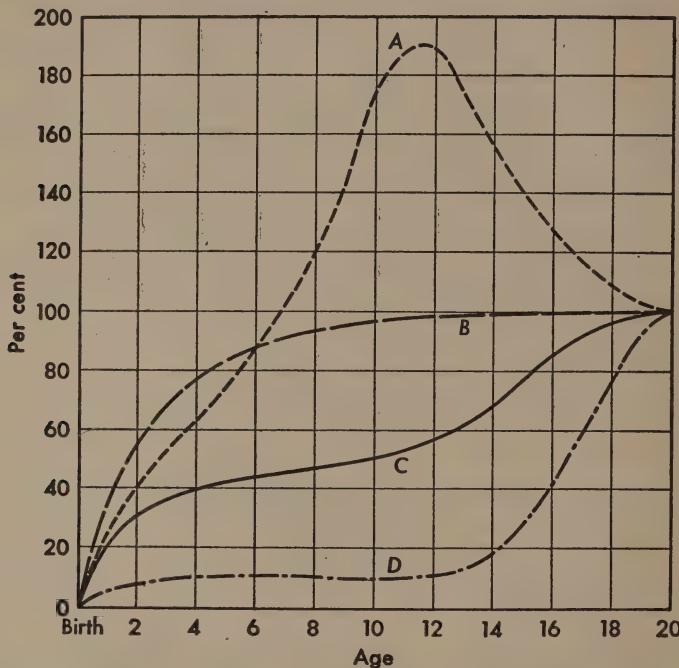


FIG. 4. The major types of postnatal growth of the various parts and organs of the body. The several curves are drawn to a common scale by computing their values at successive ages in terms of their total postnatal increments (to twenty years). *A*, lymphoid type: thymus, lymph-nodes, intestinal lymphoid masses. *B*, neural type: brain and its parts, dura, spinal cord, optic apparatus, many head dimensions. *C*, general type: body as a whole, external dimensions (with exception of head and neck), respiratory and digestive organs, kidneys, aorta and pulmonary trunks, spleen, musculature as a whole, skeleton as a whole, blood volume. *D*, genital type: testis, ovary, epididymis, uterine tube, prostate, prostatic urethra, seminal vesicles. (From Harris, Jackson, Paterson, and Scammon, *Measurement of Man*, University of Minnesota Press, 1930.)

comparison of the growth of the major parts of the nervous system, the genital system, the lymphoid system, and the body as a whole. Figure 4 contains four curves, which show the course of the growth from birth to the age of twenty. Observe that the curves indicate what is the percentage of development at any age of the development reached at twenty, which is essentially the age of maturity. Study Fig. 4 very carefully, for it contains much information fundamental for understanding human nature and human development.

Note curve A which represents the lymphoid type of growth. The lymph is involved in fighting germs and keeping the body healthy. It is interesting to note that lymphatic development is greatest at the age of eleven, when the death rate is about the lowest. We can never be sure of cause and effect relationships, but it is interesting to observe how facts are related.

There should be good circulation of the lymph, for in a sense it is the scavenger of the body, receiving germs and the waste products of infection. Consequently, a child should have plenty of wholesome exercise for promoting active circulation.

The course of growth of the body as a whole has been described previously in this chapter. It will be noted that it has a growth curve of its own, differing from the others. There are two periods of rapid growth, the first 2 years of life, or the infant spurt, and the adolescent spurt, which begins at the age of about twelve on the average.

The growth of the brain follows a course that is easily described because it is very simple. From birth the brain grows very rapidly, apparently determined to achieve its full growth as soon as possible. At the age of four, nearly 80 per cent of its total weight has been reached; by eight, 90 per cent of its weight has been attained. During the remaining 12 years from eight to twenty the remaining 10 per cent of growth is achieved. Nearly if not quite all the brain's weight is reached at twenty.

The reader should keep in mind that we are speaking of the weight of the brain. It is possible and even probable that the development of the brain does not follow precisely its growth as determined by scales, which measure in pounds and ounces. By this we mean that there can be changes or developments in the brain which are reflected in only a very small change in weight. In fact, tests of mental development indicate that measured mental power and ability do not increase as rapidly as the weight of the brain and that there is much more growth and development in this respect after the age of four to six and comparatively less before. This is probably due to the fact that after the age of four to six the changes that do occur in the brain are more important psychologically than the increase in weight might indicate.

At least we know that Nature hurries to give us our full mental power, so that we can have it as soon as possible, by establishing the full or nearly full anatomical basis (the nervous system) for intelligence by about the age twenty or the early twenties. The amount of growth and development after twenty is surely not very great. The implication

of this development for child and adult education will be discussed in the chapter that deals with mental development as determined by the use and application of mental tests. Suffice it to say here that, as a child grows older, his powers increase from the process of becoming older and that, by delaying some instruction which is too hard for a child, this will be comprehended satisfactorily a year or two later.

The genital type of growth is almost the exact opposite of the growth of the brain. When the brain is growing most rapidly, the geni-

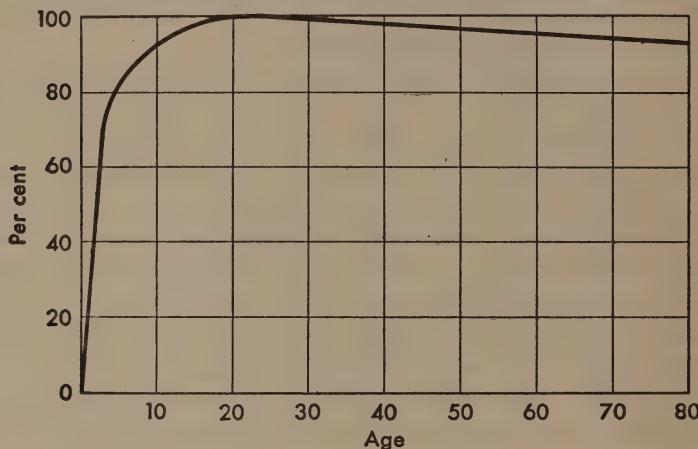


FIG. 5. Weight of the brain from birth to old age.

tals, or sex organs, are growing least rapidly; when the brain is growing least rapidly, there is a spurt in the growth of the genitals.

By the age of fourteen only 20 per cent of genital growth has been reached. Growth then increases very rapidly, and between the ages of fourteen and twenty 80 per cent of genital growth is attained. The beginning of this spurt is a true adolescent spurt and corresponds closely with the adolescent spurt in general physical growth. Both have their beginnings between the ages of twelve and fourteen, though the increase in growth of the genitals is much more pronounced than general body growth. It is conceivable that the maturation of the sex glands and organs, along with the hormones or chemicals that they give off, stimulates physical growth and therefore accounts in part, at least, for the acceleration of body growth at the beginning of puberty.

The adolescent period, or the *teens* as the period is popularly called, is the period of rapid sexual development. It is during this time that the human being becomes capable of reproducing itself. The beginning of adolescence is called *puberty*.

During adolescence, boys and girls become especially interested in each other. They have dates and go to dances and parties, and in general the spirit of romance begins to kindle. They seek bodily contact with each other, as by holding hands, kissing, hugging, "necking," and "petting." The new desires and practices that develop in adolescence have, clearly, a physiological basis. These new desires are in part based on the sex drive resulting from the maturation of the sex glands during the teens.

As a consequence of these sex interests, which lead to romance, marriage, and the responsibility of fatherhood and motherhood, it is desirable that in the adolescent years and to some extent in the pre-adolescent years, also, junior and senior high-school students be taught the physiology of human development so that they will understand the physical changes that they are undergoing. They should be taught about sex and also about family responsibility so that they will be intelligent about themselves and their problems.

It is a good school, too, that has a rich program of social events—parties, games, athletic contests, musical organizations, and clubs. By means of such organizations and their activities, boys and girls in their teens have wholesome outlets for their interests and energies.

Puberty and Adolescence. These are two terms that everyone should know in order to understand boys and girls of junior and senior high-school age. Puberty marks the beginning of the period of life when a boy or girl is capable of producing children. The boy reaches a stage of development at which the sexual glands first produce the sperm, or male germ cell, which is capable of fertilizing the ovum, or the female germ cell. In short, puberty is the earliest age at which a boy is capable of becoming a father—usually at thirteen or fourteen, on the average. Puberty in the girl is the age at which she is first able to become pregnant or to bear children—at twelve or thirteen, on the average.

Puberty marks the beginning of the period of adolescence, which roughly corresponds to the teens. The teen-agers, those thirteen to nineteen, are adolescents. Adolescence ends when maturity is reached, at about the age of twenty. Figure 4 shows that the period of adolescence corresponds to the period when the genitals begin their rapid growth, at thirteen, until maximum or nearly maximum development is reached, at twenty.

Adolescence is the period of transition from childhood to adulthood. Girls acquire the body that is characteristically womanly, and boys acquire the characteristics of a man. The voice of the boy changes

and deepens to that of a man, but in doing so it often cracks or plays tricks. This may embarrass the boy, but it is a short-lived upset, which will soon be overcome. Tender down appears on the face, which is the butt of many not-so-tender jokes, but the down soon becomes whiskers, stiff and stubborn enough to challenge most razors.

During adolescence there is a sharp increase in growth for both girls and boys, which lasts 2 to 4 years. Girls shoot up a year or two earlier than boys. During this short gallop to adult size, sensitivity may develop about one's new size and the consequent outgrowing of one's clothes. The teacher should be alert to the problems of boys and girls when they are growing very fast.

Accompanying this rapid growth of the body in general and the genitals specifically is an intensification of the sex urge and the interest of the sexes in each other. In this we have the source of one of life's most dominant interests and urges. Here, too, teachers can do much to help boys and girls have happy, wholesome relationships.

Relation between Height in Childhood and Height in Adulthood. Is growth among children consistent from year to year so that the relationship in size remains relatively constant? In other words, does the short child become a short adult, the average child an average adult, and the tall child a tall adult? In general, this is the case—height in childhood indicates adult height. There are exceptions, however. Some prove to be considerably taller or shorter as adults than might have been predicted from their heights as children. This occurs probably in the case of one in five persons.

Growth varies in speed from individual to individual and also during the growth period of any one person. Growth is more rapid at certain periods than at others, but it does not fluctuate in the sense of being "jumpy." There are some individual fluctuations; but the curve showing growth over a period of years is a relatively smooth one, indicating a more rapid growth during some periods of life than at others but nevertheless showing a steady, consistent growth.

Generally, children who are very tall tend to be not quite so tall relatively as adults. Similarly, children who are very short for their ages tend to be not quite so short relatively as adults. This tendency is called *regression*. Not all very tall or very short children tend to regress toward the average in height, but most do.

Another factor indicating what the final height will be is the age at which a child reaches puberty or the age at which the adolescent spurt begins. Children who reach puberty or the adolescent spurt early tend to grow less from that age until maturity is reached than do those

who reach the adolescent spurt later. For example, of two equally tall girls at the age of eleven, one begins the adolescent spurt at eleven and the other at fourteen. The girl who begins the adolescent spurt at fourteen will probably in the end be the taller. In general, those for whom the adolescent spurt is delayed usually achieve greater height, say, from the age of ten or eleven or twelve to the age of twenty, than those who reach puberty or begin the adolescent spurt earlier.

Physique and Personality. The size and shape of a person influences his personality. If a boy or man is large, of good physical proportions, and well muscled, his personality is likely to be affected favorably. He may, of course, be a bully or overaggressive, but it is more probable that he will have a feeling of wholesome confidence and will be socially acceptable. He is likely to be respected by his fellows and popular with them and attractive to the feminine sex, who generally favor men who are strong and "manly" in appearance.

Girls of attractive physique have comparably the same advantages. They usually are well adjusted emotionally and socially and evoke more favorable responses from others than do the less attractive. Consequently, they are likely to be more successful socially than those of poorer physical development.

Specifically, among the physical characteristics that influence the feelings and emotions and thus the personality is the fact that as children grow to adulthood their legs become proportionately longer. During the adolescent spurt, some boys and girls, especially those who are slender or underweight, may appear to be leggy. The arms, too, seem long and dangling. These effects are accentuated if clothes that are outgrown are worn during the years of rapid growth.

The adolescent years have been referred to as the *awkward age*. Actually, such awkwardness is not the result of a lack of physical or athletic skills, for adolescents are really very capable athletes. The occasional awkwardness of adolescents is evident in situations where they feel self-conscious, where they feel sensitive about themselves. Their bigness is new to them. Because of their recent sexual development, they have new interests, which they are awkward in expressing. Thus in a social situation the adolescent may trip or stumble, become "tangled up in his feet," and withdraw awkwardly. Rather than a deficiency in physical coordination, the emotions and feelings and self-consciousness in large part are the basis of this awkwardness.

The comparative size of a person reflects itself in his attitude. A child may feel inferior in the presence of adults because they are so much larger than he. Consequently, it is not well for children to be

with adults most of the time. A child who is only with adults may show the effects by being docile and by being influenced by feelings of inferiority.

A child small for his age often develops feelings of inferiority. Others of his age group are bigger and stronger than he. As a consequence, he may seek the company of children younger than he is but who are his own size. He may isolate himself and thus avoid the give-and-take with boys and girls his own age. On the other hand, a small person may seek his satisfactions in his studies, in music and reading. He may try to surpass his fellows in school and gain satisfaction in this way. He may compensate for his lack of physical size by being aggressive and pugnacious and by gaining the reputation of being "a fellow who isn't afraid of anyone." He may laugh and speak loudly and be a troublemaker in school so that he will be thought of as more than making up for his smallness. He feels inadequate because he is small, and he tries to make up for this in other ways.

It should be noted, however, that not all undersized persons reflect the fact in having skewed personalities. Many small persons are happy and well adjusted. We must not generalize too readily. For example, to attribute Napoleon's aggressiveness and desire to conquer all Europe to the fact that he was a small man and therefore sought to demonstrate to the world that he was a most powerful man is probably carrying an idea too far.

What we are speaking of now is people who are physical deviates. By a *deviate* we mean someone who varies, or deviates, considerably from the average. A person who is very small, very large, too fat, or too thin is a deviate.

Those who are very fat may have personality problems. They sense the attention they attract because their clothes are too small, because they have difficulty in getting into their seats, or because they are not alert on the playground. They are nicknamed "Fat" or "Punk" or "Slats" or "Tubby"—names that are unwelcome because unpleasant and derogatory.

The personality effects of being tall and very thin are also not good. Thinness is symbolic of weakness, and tall, thin people feel this. They are called "Skinny," "Spike," or "Slim" and are referred to as "string beans." All this lessens the feeling of confidence and personal worth.

Girls who are considerably taller than average seem overconscious of their height, no doubt because they regard tallness as undesirable. The average height of women is about 5 feet 4 inches. Girls and women who are, for example, 5 feet 9 inches or 5 feet 10 inches and taller may

feel that they are extremely tall, especially if they are very tall and "gangly" during adolescence.

Girls possibly feel that being tall is a social disadvantage which reduces matrimonial opportunities. Some may stoop in order to lessen their height. Actually, what a tall girl should do is to take advantage of her height and stand erect, stately, and handsome. Most people think highly of a tall, stately girl. In fact, she has many social advantages, and she should capitalize on them.

Some children and adolescents do not like to go swimming because they are sensitive about their bodies. References to their skinniness or fatness or their lack of muscular development causes them to feel inadequate. For similar reasons, children may not like to wear "gym" clothes. The roly-polys and the thin and angular do not feel so secure as in their usual clothing. However, it is good training for some children to have to face such unpleasant situations, especially if the teacher can show them how to achieve a physical development of which they can be proud.

Achieving Good Physical Status. It should be apparent to the reader that a person's physical growth and development are related closely to his social and personal problems. The question that should be asked is: What can we do about achieving a good physical status? The teacher and parent can do much in cooperating with the child to achieve optimum physical growth and the best mental hygiene.

By eating and exercising wisely a person who is too fat can usually attain normal or nearly normal weight. Similarly, a person who needs more weight can often attain this by resting more and eating foods that tend to increase weight. A diet should be undertaken only under the direction of a good doctor.

There is little to be done about height except what having good posture can effect. It should be kept in mind that people vary in height and physical appearance and that this variation is desirable. Some prefer large people, others average, and others small. Thus the variation in taste and the variation in size ensure that everyone can be pleased.

Each individual has to determine what constitutes the best physical status for himself. People do not conform to exact types. Some are naturally sturdy and heavy while others tend to be slender, being small of bone and narrowly built. If one is in good nutritional condition, neither very fat nor very thin according to his natural tendency, there is little cause for worry. One should try through proper exercise and the correct diet to be as physically attractive as possible.

Physical Appearance and Personal Characteristics. It is true, as has been pointed out, that there can be a relationship between physical development and certain personal attitudes, especially in the case of deviates. However, we must not make the mistake of judging personal characteristics by physical appearance. We are inclined to think that a person with large, broad shoulders is determined and persistent, particularly if he also possesses a square, "determined" jaw. The slender person is often thought of as weak and vacillating. Many, even among educated persons, think that a high, wide forehead indicates a well-developed brain and consequently high intelligence. We often speak of an intelligent face or a dull one.

Now the fact is that no one can judge personal and intellectual qualities by physical appearance. There may be a few exceptions in the case of those idiots and imbeciles whose hopeless physical condition resembles their mental condition. But for over 99 per cent the physical characteristics do not indicate what the qualities of character, personality, and intelligence actually are.

Let us return to the question of the relation between the appearance of the head and intelligence. We learned in considering the course of growth of the brain that with its growth and thus its increase in size basic intelligence increases. From this it is not far to the conclusion that the size of an adult brain indicates the amount of intelligence and from this to the conclusion that the appearance of the forehead is an index to intelligence. This reasoning, however, is incorrect.

In the first place, while in general it is true that the larger brain tends to characterize the more intelligent, for over 99 per cent there is little relation between the size of the grown brain and intelligence. There have been some gifted people with brains several ounces under the average of 48 ounces and some very mediocre people with brains several ounces above this average. It is much more the quality of the brain than its quantity that is important.

The shape of the forehead indicates very little if anything about the brain or intelligence. The same can be said about the relationship of the face and physical proportions to intelligence, character, and personality.

A teacher could look over the members of her class the first days of school, study their faces very carefully, and survey their physical proportions and characteristics and still be unable to judge at all reliably their intelligence and personal characteristics. Many experiments have been made attempting to judge intelligence from studying faces, but it has been found that this cannot be done successfully.

Correlation between Physical and Mental Growth. In one sense, there is a high correlation between physical and mental growth. Over an age range from early childhood to adulthood, the physical and mental status are closely related, for increase in age is accompanied by both mental and physical growth. In other words, just as the physical growth and development of six-year-olds is advanced over that of four-year-olds, of ten-year-olds over that of eight-year-olds, of twelve-year-olds over that of ten-year-olds, etc., there is a corresponding and similar advance in mental growth and development. Both physical and mental growth correlate highly with age; consequently, over an age range covering the growth period from birth to adulthood, there is a high correlation between the levels of physical and mental development.

If, however, we remove the effect of age and consider children of any given age, there is only a very low correlation between physical and mental status. For purposes of illustration, we may consider a large, unselected group of 9-year-old children. (Almost any other age group of children would serve just as well.) In this group, all of whom are 9 years old chronologically, will be found a wide range of mental ability. This range may be expressed as probably varying from a mental age (M.A.) of 3 to one of 16. The range might be greater or, possibly, smaller. However, it will probably be found that in a large group of 9-year-old children there will be a very few who have the mental ability of an average 3-year-old and one or more who have the mental age of the typical 16-year-old, but that most of our 9-year-olds will be at the 9-year-old level, with others at the 8-, 7-, 6-, etc., or 10-, 11-, 12-, etc., year-old level. As the amount of deviation above and below nine increases, the number of children with corresponding mental ages decreases.

This description of the mental variation is applicable to the physical variation among nine-year-olds. A few will be of the size of children considerably younger and some will have the height and weight typical of children much older. Thus there will be considerable variation in the average level of physical growth.

If the mental and physical level of these children are correlated, a low correlation of about .05 to .15 will probably be found. Thus, there is very little relationship between the stages of mental and physical growth of this age group. In fact, the correlation is low for any age group. This means that, almost as often as not, a person of advanced physical development may be advanced, average, or retarded mentally. Similarly, if a person is either average or retarded physically, he is

almost as likely to be advanced, average, or retarded mentally. The same is true for mental development. One cannot judge accurately a child's physical status from a knowledge of his mental capacity. However, because there is a slight correlation between mental and physical status, high mentality, more often than not, is associated with good physical development. Among a group of bright children will be found more large, well-developed children than among a group of children who are mentally retarded. Consistent with this fact, it can be stated that among a group of physically advanced children there will be more children above average intellectually than among a group of small, "runty," undeveloped children of the same age. (There are, of course, many dull children who are well-developed physically and many bright ones who are poorly developed.) The relationship between mental and physical status of children of the same age is not marked but is sufficiently definite to substantiate the principle that desirable qualities tend to accompany each other.

Growth in Physical Abilities Accompanying Physical Growth. Just as a person's mental and learning powers grow from birth because of the growth and development of the nervous system that accompanies the process of becoming older, so do the physical and athletic powers grow from merely becoming older. A term used for the increase in these powers from birth to age twenty that is caused by becoming older is *physical maturation*.

Increase in athletic or physical skill and power is caused primarily by growing larger and by the increase in the muscular strength that accompanies increase in age and size. For example, the power with which a child can squeeze with his hand, or his hand grip, increases steadily from early childhood to early adulthood. This increase in the power of hand and arm is only illustrative of the increases in power that accompany growth and development. The legs become longer and stronger, and so do the muscles of the torso and those of the neck.

Thus, as a child grows older, he can lift more, swing a heavier bat and swing it faster, throw a ball farther, run faster, jump higher and farther, and kick a ball harder than he could when he was younger. Practice helps, of course, but the increase in athletic and physical skills and powers is largely attributable to the growing bigger and stronger that, for a child, accompanies becoming older.

This change in physical power is reflected in the norms, or standards of performance, of boys and girls of different ages as shown in Table 1. These are averages, or norms, and thus represent average achievement. It is apparent from an examination of the figures that

physical abilities do improve with age during childhood and youth. Boys and girls as they become older are able to jump farther, throw a ball a greater distance, run faster, and chin themselves more times. This increasing motor and athletic capacity accompanies growth and development, though it is in part a product of practice and training, also.

The values given are averages—sight must not be lost of the great variation in the capacity of children of each age group. This variation

TABLE 1. PHILADELPHIA ELEMENTARY SCHOOLS AGE AIMS FOR TRACK AND FIELD EVENTS*

Age	Standing broad jump, feet and inches		Ball throw overhead, feet		30-yard dash, seconds and fifths		40-yard dash, seconds and fifths		50-yard dash, seconds and fifths		Chinning	Knee raising
											Times	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
8	4-0	3-8	17	15	6-2	6-4	8-0	8-3	9-2	9-4		
9	4-4	3-10	19	17	6-1	6-4	7-4	8-2	9-0	9-3		
10	4-6	4-0	21	19	6-0	6-3	7-3	8-1	8-4	9-2		
11	4-10	4-2	23	21	5-4	6-2	7-2	8-0	8-3	9-1	1	16
12	5-0	4-4	25	23	5-3	6-1	7-0	7-4	8-1	9-0	2	25
13	5-2	4-6	27	25	5-2	6-0	6-4	7-3	8-0	9-4	3	28
14	5-6	4-8	30	27	5-1	5-4	6-3	7-2	7-4	8-3	4	30
15	5-10	4-10	33	28	5-0	5-3	6-2	7-1	7-3	8-2	4	32
16	6-2	5-0	36	29	4-4	5-2	6-1	7-0	7-2	8-1	5	35

* Taken from J. F. Bovard and F. W. Cozens, *Tests and Measurements in Physical Education*, p. 117, W. B. Saunders Company, Philadelphia, 1938.

in physical capacities is wide, just as it is for mental and personal qualities. There are a few eight-year-olds who can run faster, jump farther, and throw a ball farther and who, in general, have more motor skills and power than some twelve-year-olds. Conversely, some fourteen-year-olds cannot play ball so well or are not so skillful in various games as some nine- or ten-year-olds. There are great variations in sensorimotor abilities at each age, but the averages indicate that there is a steady growth of motor skill and power throughout the years of childhood. It is this growth and development that should be understood, along with physical, mental, social, and personal development. Then the education of the child will be in full cooperation with nature.

The standards of physical performance are comparable with the standards for mental performance. It is expected that as a child grows older he can give the meanings of more and harder words, can work harder arithmetic problems, and can comprehend more difficult

directions. For these and other mental tests, there are standards for each age.

In connection with the standards for physical performance the reader may hold that the standards are raised and better performance is expected of each older age group because of experience. For example, better performance is expected from nine-year-olds than from eight-year-olds and from ten-year-olds than from nine-year-olds, because as children grow older they get more practice and thus improve in skills. According to this point of view, a child improves in motor skills and becomes stronger, not from growing stronger and bigger, but from practice.

In considering this, let us assume that a group of boys stop growing at age nine. They are an average group of boys who can run 50 yards in 9 seconds, can jump 4 feet 4 inches from a standing start, and have a grip with the right hand of about 40 pounds. Their other abilities are also average for nine-year-olds. Now at nine we assume that they grow no more. They will practice and train and as a result will increase their motor and athletic skills. But will they keep up with a second group of nine-year-olds who in due course become ten-year-olds and then eleven-year-olds, etc.? No, of course not, for the latter group are not only receiving exercise and training but are growing older and stronger too. Our hypothetical boys who stop growing at the age of nine will never be much better than average nine-year-olds, for their bodies are not growing. They will develop their nine-year-old muscles to the maximum, but they will soon reach their limit.

Teachers should take into account the stage of physical development reached by their children. They should realize that there are certain standards of performance for each age group but that there is a great variation in the abilities of children of each age. Children should play and exercise but should not overdo it. They should not be allowed to become "dead-tired" but should stop playing when they still feel like playing some more.

Sex Differences in Physical Development. From birth to puberty, girls are on the average almost as large as boys. But girls reach their adolescent spurt a year or two earlier than boys and consequently, between the ages of about eleven or twelve to about fourteen or fifteen, are larger. At this time they are physiologically ahead of boys. They are more mature, for they have reached puberty at an earlier age and become temporarily a little larger. This gives them a feeling of prestige.

You may have observed that girls of thirteen, fourteen, and fifteen usually prefer the company of boys a year or two older than themselves.

The reason for this is the fact that a girl likes the idea and security of being with a boy who is bigger and stronger than she. She often looks upon the boy of her own age who is smaller than she as not being grown up. "He's just a child," she may think. The interest in boys a little older than themselves seems to persist, for generally girls marry boys a little older than they are.

It is during these years of eleven and twelve to fourteen and fifteen that girls join boys in some of their sports. Girls feel their strength and size at this age and so play games like baseball and basketball vigorously. It is usually their last fling at the more manly sports, for they soon find more pleasure in individual sports and social activities.

Interrelation of Motor and Athletic Abilities. This topic raises the question of whether or not a person, if good at running, is good at jumping; if good at throwing a ball, is good at batting one; or if good at juggling, is good at tumbling. Also, we may ask, if a person is a good athlete, will he be skillful at using the tools in a manual-training shop? If a person is a good basketball player, will he be a good baseball player? Will a good football player be a good tennis player? In other words, to what extent are physical and motor skills and abilities related or correlated?

Let it be said at once that there is not a complete correlation of motor and physical abilities. Those who are best in one skill are not usually the best in all skills, though they are usually above average in all or certainly in most of them. Those who are average in some skills, say running or catching, are usually average in other skills, such as throwing or jumping, and those who are very poor in one are generally poor in others.

In other words, if a person is a very good baseball player, he is likely to be a good basketball player if he chooses to play basketball. The same can be said for other sports. It is true, of course, that players make a specialty of their best game and do not play the others very much. But the likelihood is that a person who displays a high order of motor and physical skills in one game can also do so in others. Similarly, a person who has a high order of skills in the machine and manual-training shop will also have more than average skills in the play field.

Though there is not a perfect correlation of motor and physical skills and abilities, they are interrelated to a considerable extent. This is to be expected, for in general the power, strength, and skill of hands, arms, legs, head, and torso are involved in many physical activities. Furthermore, we must not overlook the eye and ear, the keenness and sensitivity of which affect so many of our motor and physical activities.

Left- and Right-handedness. About one child in six or seven is left-handed, in spite of the fact that this is a right-handed world. There are many theories to account for this. It is claimed by at least one student of the problem that the left-handed are born left-handed. Others claim that the left-handed have had early experiences which caused them to be left-handed. The likelihood is that during early childhood accident or circumstances caused the left-handed person to prefer using the left hand.

Possibly some children have a "natural tendency" to be left-handed because of certain peculiarities in the organization of the nervous system. Some children are trained to be left-handed. Use of the left hand then becomes a habit. For example, an athletic coach trained his son to be left-handed because he felt that it would be to the son's advantage when he participated in sports. Incidentally, the father was left-handed. It is quite probable that if we started in infancy we could train most children to be either left- or right-handed. If we trained the child to prefer the right hand in taking hold of objects, the child would become right-handed. Conversely, by favoring the left hand, the child would become left-handed. Because it is conventional to be right-handed, most children are so trained.

What should be done about handedness as an educational problem? For example, if a person is left-handed, should efforts be directed to making him right-handed? This question is more important than it may seem on the surface. In fact, it is the most important problem in connection with handedness because of the emotional disturbances that may be produced in a child by coercive or disturbing attempts to cause him to change to right-handedness. Some investigators contend that stuttering is the result of trying to change the handedness of a child, though others disagree. It is probable, though, that unwise handling of the handedness problem can harm the child. The attempt to change handedness after habits in the use of the hands are well established can upset a child emotionally and injure his personality. Here are some of the principles to observe:

Handedness, either left or right, is determined in infancy and early childhood. At that time, the child should be trained in the establishment of the handedness that is desired by controlling his grasping and manipulation of objects and things.

If a child is to be retrained to use another hand, this should be done early in life, preferably before starting school. There is seldom a change of handedness after the age of seven or eight. By that time, the hand-

edness habit is well fixed. Thus the correction of handedness should hardly be a school problem at all.

The training of a child to prefer the other hand should be done thoughtfully so that the child will not be upset emotionally. Little games involving the use of the preferred hand may prove helpful. The problem should never be considered so important that the parent by force and vigorous control tries actually to "break" the left-handedness, for it is possible thus to produce stammering or unfavorable emotional reactions. In general, it is best not to try very hard to change handedness but to accept the handedness that persists.

SUMMARY AND REVIEW

We study physical growth and development because this enables us to understand how education can be most effective for the intellectual, physical, and personal improvement of the student.

There are four phases of physical growth: (1) the first two or three years of rapid growth; (2) the steady growth from age three to the beginning of the adolescent spurt, usually at ages twelve and thirteen; (3) the spurt to about fifteen or sixteen; (4) the slower growth to the age of about twenty.

A child should be at a weight that is most healthful for him. If a child is in the lightest or heaviest 10 or 15 per cent for his age and height, his physical condition should be evaluated by a doctor.

With increase in age, the brain and body grow and develop and thus increase the mental and physical capacity of the child.

In adulthood the body has different proportions from what it had in childhood, the head being proportionately only one-half as large, the torso being the same, but the legs being proportionately one-third larger.

Growth refers largely to increase in inches and pounds. *Development* includes, not only growth, but also changes in nature and composition.

Children should be fed, exercised, and rested in order to achieve maximum health. Poor food, too strenuous exercise, and fatigue should be avoided. Good nutrition seems to have a good effect on the temperament. Athletics should not be too strenuous, and the good coach works for the healthful development of his boys.

The brain grows most rapidly during the first five or six years of life, after which it increases slowly until maturity is reached at the age of about twenty. The genitals grow slowly until about the age of twelve or thirteen, when they develop rapidly to the age of twenty.

The lymphoid type of growth reaches its maximum at about the age between eleven and twelve and then declines.

Puberty is the beginning of adolescence and of the period when a boy or girl can beget or conceive children. Adolescence is the period of the teens. It is the period between childhood and adulthood.

Size, strength, thinness, fatness, and general physical development may affect personality favorably or unfavorably. A person should eat and exercise in a healthful way so that he may achieve the best possible physical development.

Personality and character cannot be judged from physical appearance.

There is a slight positive correlation between mental maturity and physical development.

A child obtains increasing physical power and capacity for skills from the physical growth and development that accompany the process of becoming older.

Girls mature a little earlier, or reach puberty a little younger, than do boys and are larger for two or three years.

Do not try to change the handedness of the child if this upsets him seriously.

Test Your Thinking

1. During the junior and senior high-school years, girls prefer the company of boys who are about a year or two older than they. Can you explain this preference in terms of the growth curves of boys and girls?

2. Johnny and Mary are two sixth-grade children. Johnny is very thin and in weight is in the lowest 10 per cent of children of his height and age, while Mary is very fat and classifies in the heaviest 10 per cent of children of her height and age. What health and personality problems may these children have? What do you recommend?

3. An average child, $6\frac{1}{2}$ years old, is having difficulty with his reading. How will growth help him so that he can master this same material a year or two later?

4. Explain how a program of health, physical education, and athletics can be adjusted to the growth of children.

5. Do you feel that the changes in the proportions of body parts from birth to maturity indicate the wisdom of Nature? Have you any improvements to suggest?

6. Note the pattern of growth of the brain and of the genitals. How do these patterns of growth influence human interests and behavior?

7. Name and explain as many characteristics of adolescence as you can.

8. Physical development is important in terms of education and health,

but its importance in connection with personality and mental health is often overlooked. Discuss this latter relationship.

9. Big, strong, and dull; small, weak, and bright—may children ordinarily be classified in one of the two preceding groups?

10. Discuss whether or not mental and physical abilities increase with age during childhood and adolescence in about the same general manner.

11. A third-grade teacher said, "Bruce Brown is left-handed, and I am going to make him right-handed even if I have to use force on him every day he is in school." Comment.

References

- DEARBORN, WALTER F.: The Mental and Physical Development of Public School Children, *School and Society*, **41**: 585-593, 1935.
- DEARBORN, WALTER F., and JOHN W. M. ROTHNEY: *Predicting the Child's Development*, Science-Art Publishers, Cambridge, Mass., 1941.
- HARRIS, J. A., C. M. JACKSON, D. G. PATERSON, and R. E. SCAMMON: *The Measurement of Man*, University of Minnesota Press, Minneapolis, 1930.
- JONES, H. E.: Relationships in Physical and Mental Development, *Review of Educational Research*, **9**: 91-102, 1939.
- JONES, H. E.: The Development of Physical Abilities, *Yearbook of the National Society for the Study of Education*, **43**: 100-122, 1944.
- JONES, H. E., and R. H. SEASHORE: The Development of Fine Motor and Mechanical Abilities, *Yearbook of the National Society for the Study of Education*, **43**: 123-145, 1944.
- KATZ, EVELYN: The Relationship of I.Q. to Height and Weight from Three to Five Years, *Journal of Genetic Psychology*, **57**: 65-82, 1940.
- LAIRD, D. A., M. LEVITAN, and V. A. WILSON: Nervousness in School Children as Related to Hunger and Diet, *Medical Journal and Record*, **134**: 494-499, 1931.
- MCCLOY, C. H.: *Tests and Measurements in Health and Physical Education*, 2d ed., F. S. Crofts & Co., New York, 1942.
- PRYOR, H. B.: *As the Child Grows*, Silver Burdett Company, New York, 1943.
- RAY, H. C.: Inter-relationship of Physical and Mental Abilities and Achievement of High School Boys, *Research Quarterly of the American Association for Health and Physical Education*, **11**: 129-141, 1940.
- ROTHNEY, J. W. M.: Recent Findings in the Study of Physical Growth of Children, *Journal of Educational Research*, **35**: 161-182, 1941.
- STUART, HAROLD C.: *Healthy Childhood*, D. Appleton-Century Company, Inc., New York, 1933.
- TERMAN, L. M., and others: *Mental and Physical Traits of a Thousand Gifted Children (Genetic Study of Genius*, Vol. I), Stanford University Press, Stanford University, Calif., 1926.
- TILNEY, F. C.: *The Master of Destiny, A Biography of the Brain*, Doubleday & Company, Inc., New York, 1930.

CHAPTER II

MENTAL GROWTH AND DEVELOPMENT

What to Look For. Review the facts about the growth of the nervous system, remembering that intellectual development follows the course of neurological growth.

A considerable amount of discussion is devoted to the idea that children increase in mental power because of the growth of the nervous system that takes place with increase in age. Try to acquire a thorough mastery of this idea.

Growth in mental ability is explained in terms of the growth in the ability to use words, or the increase in vocabulary; the increase in memory span; and the development through the stages of enumeration, description, and interpretation. The reader should understand these explanations.

Look for the curves depicting mental growth of three intelligence-quotient (I.Q.) levels—130, 100, and 70. Note the relationship between age and increase in mental level.

Mental maturity and the importance of the adult years are discussed in considerable detail. Learn the following:

1. Age when mental maturity is reached.
2. What happens to the mental powers during adult years.
3. The value of the adult years for education.
4. How the teacher should utilize her adult years.

Introduction. The Smiths have a little girl of five named Madeline whom they like to "show off" as a very bright or precocious child. Every day her parents try to teach her new words, most of which are words one would expect a high-school pupil to use. Her parents also try to teach her to read and encourage her to repeat "cute" sayings. Everything her parents can do to make her appear clever they do, and they feel proud of Madeline's "flashes of brightness." Madeline is displayed at every opportunity.

The Petersons are neighbors of the Smiths. Their little John is about the same age as Madeline. Mrs. Peterson is jealous of the Smiths and their Madeline and wonders if they shouldn't "work on John."

"No," replies the father, "John is too young for this high-pressure teaching. Let him grow up normally. Nature will give him more brains as he grows older. There is plenty of time, but I do hope he works hard at learning after he reaches junior high school and more especially after he reaches high school and college. I hope he keeps learning after he grows up because then he's got all his brains and can learn best."

"Yes, but look at Madeline," remarks Mrs. Peterson.

"Oh, forget Madeline, poor kid. She is only being used to please her parents' vanity. When she has been in school a year or so, she'll be down to her real level. At present she may be developing some stresses and strains, some bad habits and attitudes that may handicap her all her life. John's a good boy, and he'll get along, especially if you don't start to high-pressure him at this tender age."

And this statement by Mr. Peterson more or less settles the question, although Mrs. Peterson would like to show Mrs. Smith that John is just as clever as Madeline.

Physical and Mental Growth. It has been shown how the body of the newborn infant grows and develops until it becomes an adult body. In growing, it increases in physical strength and becomes able to do physical work and to play games it could not when younger. Accompanying the growth of the body is a corresponding increase in physical skill and strength.

In the chapter on physical growth and development the growth of the central nervous system, brain, and nerves is also described. As you may recall, this is very rapid in the first few years of life, the brain reaching 80 per cent of its weight in the first 4 years. After this the brain grows much more slowly and reaches its maximum development some time in the early or middle twenties.

In this chapter we are concerned with the growth in mental skill and power that takes place from birth to maturity and from maturity to death. In this connection we should establish the age of maturity as being reached in the early or middle twenties. Often twenty is considered the age of maturity. It is probably satisfactory to consider twenty as the beginning of the period when maturity is reached, a period that can be most satisfactorily regarded as being the age period of twenty to twenty-five years. Some time during that age period, mental and physical maturity are reached.

Growth of Mental Ability. In respect to mental growth and development, certain questions arise about the change in mental powers that takes place as an infant grows older day by day, month by month, and

year by year. As a child is able to run faster as he grows bigger and stronger, similarly does he learn to read faster because his nervous system grows and develops? Can a child from the mere fact of becoming older solve harder arithmetic problems than formerly? As children become older, they increase in height and weight and acquire more skill and power in playing with a baseball, football, or basketball. Correspondingly, do they also acquire a larger vocabulary and the ability to use more words because their nervous systems grow and develop? Does a child as he grows older develop a better memory, does his reasoning power improve, and can he use his imagination better? Can he perform mental tasks more rapidly, and more difficult ones? Can the child at twelve read a page or do arithmetic problems or understand words that were too difficult for him at the age of six? Do mental powers increase because of the neural growth that accompanies an increase in age?

The answers to all these questions are in the affirmative. As a child grows older from infancy to maturity, his mental powers do increase. This growth in mental capacity is caused by the growth of the body and its parts in general, but more particularly by the growth of the nervous system. At birth the brain and the nerves that lead to it are not fully developed, although they are well advanced on their way toward maturity. The brain and the nerves grow and develop very rapidly after birth. Thus the cells and the billions of fibers of the nervous system grow and develop. The chemical composition of the nerves changes, too. In other words, these parts mature, and accompanying this maturing of the nervous system is an increase of mental capacity or power.

Of course, as the child grows older, he has more and more experience in using his mind. This increasing experience in talking, reading, doing arithmetic problems, asking and answering questions, listening to and trying to remember directions, and almost countless other ways exercises and equips the mind and causes it to become stronger, so to speak. Thus the use of the growing and maturing mind is fundamental, too, in developing it.

We know that muscles are enlarged and strengthened by proper exercise. A child's legs, arms, and body are made stronger by healthful play. We can deduce that the mind with its organic counterpart, the nervous system, improves and becomes better equipped because of use and exercise in the form of reading, calculating, memorizing, speaking, imagining, and other mental activities. There are psychologists who believe that this is definitely the case.

Increase in Mental Ability from Growing Older. The development of mental power that takes place between birth and the early twenties is produced by both organic growth and the use and exercise of the nervous system. The question might be asked whether or not mental power would increase during the growing years if there were no training or education. Hypothetically, let us consider the mental development of a child who at eight years of age lives in an intellectual vacuum for a period of, say, 4 years. His life is to be normal except that his mind is to be asleep for 4 years. In other words, the body of the child, including the nervous system, is to grow naturally, but the mind is to have no activity whatever. There is to be no talking, reading, reasoning, or thinking. This is practically impossible, of course, but for purposes of this example we are assuming a complete "blindness" of the mind for 4 years.

Now the question is: Will the mind or intellect when the age of twelve is reached, after 4 years of complete mental barrenness, be advanced over the age of eight? During these 4 years, did the brain and the nerves grow and develop so that mental power has increased during the years from eight to twelve?

Of course, in the absence of actual experiments it is impossible to answer such a question authoritatively. It is not at all likely that the mind could be "adjourned" for a period of years while the child kept growing organically at a normal rate. Nevertheless, we can speculate. On the basis of the facts on maturation that we possess, the author is inclined to believe that the brain and the potential mind at twelve would be on a level considerably higher than it was at eight, even though not used for a period of years (in this example, 4 years). The reason for believing that mental power would increase even though the mind had been completely dormant for 4 years is the fact that the brain and the rest of the nervous system would have grown. In other words, the organic basis of mental power would have become larger through growth, and there would also have been developmental changes in the parts of the nerves that give the mind more power.

It is quite likely that when the mind resumed activity after 4 years of complete disuse it might at first be weak. When a child has been in bed for a long time and then first gets on his feet, his legs are weak. But it is not long before he regains his old strength and more, too, because he is older and bigger. Similarly, it can be postulated that the mind at twelve would soon recover from its period of disuse and in a short time be well in advance of what it was at the eight-year level. It would be above the eight-year level, it is believed, for even if the

mind was not used, according to our illustration, the nervous system grew and developed because the child was growing and developing physically.

A question that logically follows is whether or not the child would be at the twelve-year level mentally. He would, it is almost certain, be above the eight-year level potentially when he resumed mental activity after 4 years of mental *absentia*, but the probabilities are that actually he would not be at the twelve-year level. He would not have gained in 4 years as much as a normal child, who has gained from both growth and exercise. Consequently, our hypothetical child on resumption of mental activity would have a mental potentiality of nearly twelve but actual mental abilities near the eight-year level, which he had reached when he began his period of "mental anesthesia."

One more question: Would the child "catch up"? In other words, would he regain what he lost by being mentally inactive for 4 years? Of course, we have no more adequate answer to this question than to the others. Again, we can only speculate, using the knowledge we have on growth and maturation. It is possible that the normal age level of mental power would be regained. It is possible that 4 years of disuse is a period not long enough to cause a loss that would not be completely regained. But surely there is a period of complete disuse long enough to cause a loss so great that not all of it could be recaptured. If the brain and nerves were not used, in other words, if impulses did not travel over them as they do in memorizing, reading, thinking about relationships, and the other mental processes, they probably would not develop fully and consequently mental power would not increase at the normal rate. Surely, if a period of mental disuse continued, a time would be reached when loss set in that could not be regained. Possibly this point would be reached comparatively early and possibly not—this we do not know.

The purpose of the foregoing discussion is to emphasize the fact of increase in mental power in a child merely from the growth and development that accompanies growing older and also the importance of practice and exercise in causing mental power to increase. It should be realized that the natural organic growth of a child's nervous system gives him greater potential mental power.

Growth of Ability to Use Words. At birth a child can utter only sounds, and these are usually the sounds of crying. As he grows older, the sounds begin to differentiate a little into "da da," "de de," and others. By the age of one or a little later a simple word or two may

be spoken. After the first word is spoken, the speaking vocabulary increases rapidly until mental maturity is reached.

Vocabulary is sometimes differentiated according to the words a person uses in speech, the words he uses in writing, and the words whose

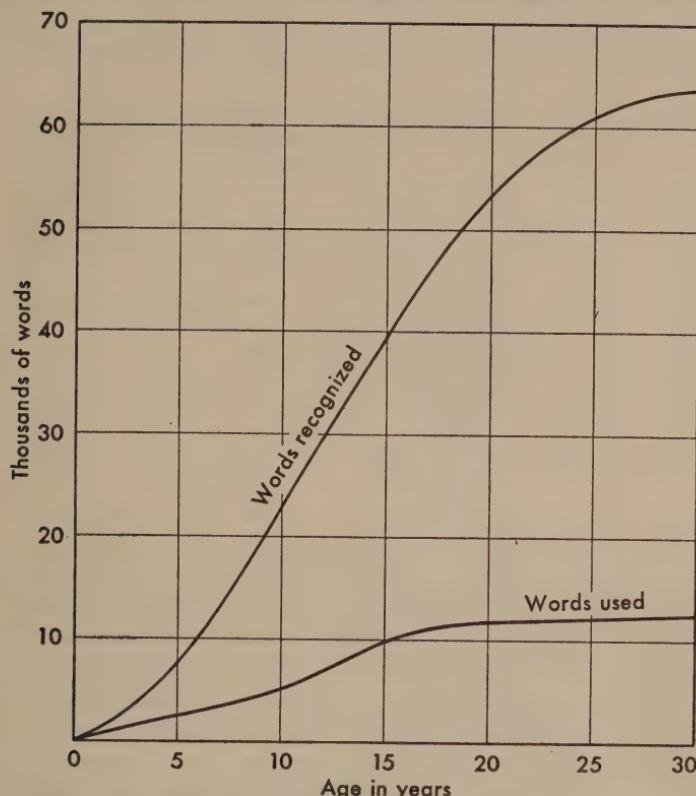


FIG. 6. Mental development as indicated by growth in vocabulary. (From John J. B. Morgan, *Child Psychology*, 3d ed., Rinehart & Company, Inc., New York, 1942.)

meanings he knows and understands on the written page and in the spoken word. A person does not use as many words as he can recognize or whose meanings he knows. It will be of interest at this point to study the growth of the vocabulary of recognition and of the vocabulary used.

Figure 6 shows the growth of vocabulary from birth to age thirty. There are two curves, the upper one, which represents the thousands of words recognized at any given age up to the age of thirty, and the lower curve, showing the thousands of words used. It will be noted that both curves are different from some mental-growth curves because

of more rapid growth beyond the age of ten and fifteen than is evident in the typical mental-growth curve. This is especially true of the curve for recognition vocabulary, which seems rather high.

In the Terman-Merrill test of mental ability the vocabulary test appears at various year or age levels. The test consists of 45 words, and the minimum number of words defined by the subject that is accepted for passing at the given year or age level is as follows:

Year	Minimum Number of Words
VI	5
VIII	8
X	11
XII	14
XIV	16
Average adult	20
Superior adult (I)	23
Superior adult (II)	26
Superior adult (III)	30

It will be observed that there is a consistent development of vocabulary ability from year 6 up to the third level of superior adult.

The trend of the size of vocabulary during the adult years is fairly well known. As is the case with most mental abilities, there is not much change in knowledge of words during the adult years, though the trend varies with individuals. Those who read and study a good deal maintain their knowledge of words and even increase it slightly during their adult lives. Those whose experiences do not expose them much to the use of words tend to have smaller vocabularies as they increase in adult age.

Another approach for determining the growth in word knowledge is to test children of various ages and record the percentage of each age or of each school grade who can give the definition of given words. It will be discovered with each successive age group, say from six to fifteen or in any other comparable age range, that the percentage of children who can define any given word will increase with age. In other words, there will be a larger percentage of seven-year-olds who can define a word than of six-year-olds, a larger percentage of eight-year-olds than of seven-year-olds, a larger percentage of nine-year-olds

than eight-year-olds, etc. Conversely, the percentage of children who fail in defining words or in understanding their meanings goes down from age to age.

It will be observed in Fig. 7 that the percentage of correctly recognized or defined words increases with age. For example, 20 per cent of

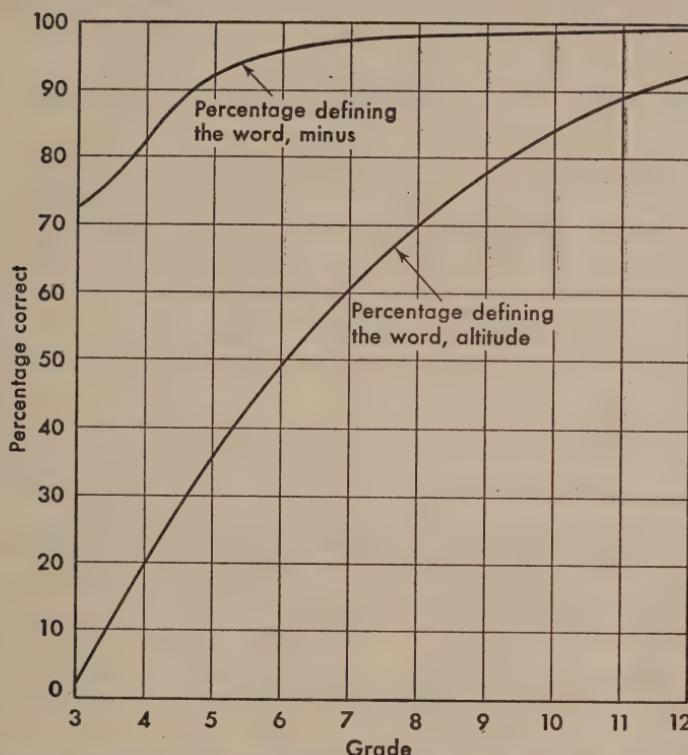


FIG. 7. Growth in mathematical vocabulary. (From L. C. Pressey, *The Growth of Mathematical Vocabulary from the Third Grade through High School*, *School Review*, 40: 449-454, 1932.)

the fourth-graders define the word *altitude*, while about 90 per cent of eleventh-graders can give its meaning.

This growth of vocabulary accompanies the growth and development of the nervous system and results, also, from the practice and experience that children get from using words and from their recurring experiences with new ones.

From the nature of the growth of vocabulary, there is a substantiation of the point of view that the extent of a child's vocabulary is a fairly good index to his general intelligence. The growth of vocabulary

is different for each individual; in general, the brighter the child, the more words he acquires and understands. The degree of brightness is reflected by the number of words a child remembers and can use. The dull child grasps and retains few, while the bright child grasps and retains many.

Development of Memory. Memory is a fundamental factor in intelligence. Without it there could hardly be any intelligence. If we did not remember any of the words we heard, the faces we saw, the general information we acquired, the places we have been in, etc.,

TABLE 2*

Repeating digits in order given		Repeating digits reversed	
Year	Number of digits	Year	Number of digits
II-6	2	VII	3
III	3	IX	4
IV-6	4	XII	5
VII	5	Superior adult (I)	6
X	6		
Superior adult (II)	8		
Superior adult (III)	9		

* Based on the Terman-Merrill norms.

we should be hopeless idiots. We should not remember what food to eat or what clothes to wear, we could learn no lessons, and consequently we should be constantly in a chaotic state.

At birth there is little memory; but, with the experience and growth that accompany growing older, memory increases. One of the tests of memory is referred to as *digit span*. In testing digit span the examiner reads to the subject numbers, or digits, at the rate of about one a second, and the subject is asked to repeat the digits after they have been given. Obviously, the memory cannot be tested by this method until the child is old enough to talk.

The method can be illustrated as follows: The examiner gives directions to the subject to this effect: "I shall read you some numbers, and when I am through please repeat them." Then the examiner reads the numbers 4, 9, 7, for example, and the subject tries to repeat them. Three other numbers are then given, and the child is again asked to repeat them. Usually three series of a given length are used in each test of digit span. If a child succeeds in repeating one series of three digits each out of three trials we conclude that he has a digit span of at least three digits.

The capacity for repeating digits increases with age according to the standards of the Stanford-Binet individual examination by Terman and Merrill. These two psychologists have used the digit span at different age levels that cover a wide range. Table 2 shows the digit span for various age levels. It should be kept in mind that these are standards for the various ages and that some children of these ages have a digit span smaller than the standard for their ages and some have a span greater.

The point being emphasized is the increase in memory span from year to year during childhood as tested by the capacity to repeat digits. This memory ability is a phase or part of general mental ability, and it grows from birth to adulthood.

Development from Enumeration to Description to Interpretation. The ability to interpret also develops with increasing age. The ability to interpret is tested by asking the subject to tell what he sees in a picture. Suppose that children are shown a picture of a woman running out of a cabin into the woods and that they are asked to tell what they see in the picture or to tell about it. There are three general stages of development in responding to the picture: (1) enumeration; (2) description; (3) interpretation.

Children of the age of three will enumerate what they see in the picture. In this instance there would be responses such as "trees," "woman," "house," "ground," "grass," or whatever the subject sees in the picture. This naming of the parts of the picture, or enumeration, represents a lower level of intelligence or mental ability than the next higher type of response, description.

Children of age six are expected to describe what they see in the picture. They may say that the woman left the cabin in a hurry. She is running into the woods. There is smoke coming out of the chimney. The cabin is located in the woods, and it is a log cabin. This constitutes description and represents a level of mental maturity or development above that of mere enumeration.

As the intelligence grows and matures still further, the ability to interpret develops. At the age of twelve a child should be able to interpret a picture. The person who sees the picture and interprets it may say that the woman is running to the neighbor for help. Her husband or child has become suddenly ill. Or the picture may be interpreted as meaning that a bear or a stranger has got into the cabin and that the woman is trying to escape by running to a neighbor. Probably her husband has come home drunk, and she is trying to escape from getting a beating at his hands. The smoke in the chimney indicates that the

day is a cool one, or it may be that the woman was cooking and baking and therefore had a fire in the stove. Such responses indicate that the subject has an understanding or a comprehension of the situation represented by the picture. Through interpretation the meaning of the situation is observed or better yet, meanings are given the situation.

The levels of enumeration, description, and interpretation are not separate and distinct in the sense that a child is at one level for a time and then jumps to the next one. A person grows steadily and develops gradually to the next level. There are different degrees at each level. There can be a mixture of enumeration and description at a given level, for example, and at a higher level a mixture of description and interpretation. As a child matures further, the power of interpretation increases and mere description becomes less prominent.

The years three, six, and twelve are the years at which average children enumerate, describe, and interpret and should be taken not as definite standards but as indicating average mental development. With different pictures the ages might be different. Nevertheless, a characteristic of mental development is represented by the levels of enumeration, description, and interpretation.

These general levels of enumeration, description, and interpretation have important implications for teaching. When teacher and pupils are discussing a topic, the teacher can control the pupils' thinking so that they merely recite or enumerate facts. If in classes on geography or history, for example, the teacher calls on the pupils for specific factual information only, such as naming of the states and their products, the boundaries of countries, the dates when the colonies were settled, or the leading American generals during the Second World War, the children will get in the habit of parroting to the teacher names, dates, and places. Such teaching and learning are not on a very high intellectual plane. A better level is one on which children and teacher at least describe the situation. Better yet than description is interpretation. A teacher will get from her pupils largely the level of responses that she stimulates. The fact should be taken into account, of course, that children in the lower grades are not very mature mentally, but they can be guided into the habit of reasoning and interpreting.

Work at the three levels of thinking, enumeration, description, and interpretation, can be illustrated from a wide range of subjects and subject matter, such as history, geography, sociology, arithmetic, language, and grammar. Almost every subject can be taught at the different levels. In teaching the development of the great American cities, for example, facts about different cities can be drilled and drilled

until the pupils will learn to "recite" these facts. Such a method is at the enumeration level. The growth of the cities can be described, also, and an interesting picture given. But best of all is to give the reasons why New York, Chicago, Philadelphia, Detroit, and other cities have grown so large and to show the influence of location on oceans, on rivers, on lakes, of surrounding territory, of natural resources for manufacturing, etc., on the development of these cities. A teacher should encourage her pupils to think in terms of reasons, causes, and forces. They should see the relationship of city growth to economic and social forces. In other words, a teacher should lead her pupils in the processes of interpreting and using their imaginations.

Children mature mentally as they grow older and naturally reach the stage of interpretation. Still, the teacher should take advantage of existing opportunities and try to create further opportunities for guiding children toward the level of interpretive reasoning. Then teaching cooperates with the mental maturing that takes place as a child grows older.

Curves of General Mental Growth. We have discussed various aspects or evidences of mental growth—memory span, vocabulary, reasoning, or interpretation—and have shown that there are growth and increase from birth to maturity. This growth tends to be of the general nature of the actual growth of the brain. Mental growth is most rapid to the age of ten, after which it slows down increasingly until maturity is reached.

In Fig. 8 are given curves for general mental ability as measured by general intelligence tests. The growth in this instance is in terms of mental age, which is the equivalent of mental level or stage of mental maturity. The base line of the diagram represents chronological age (C.A.), or the length of time a person has lived.

The curves show mental age, or mental level, according to age and according to brightness, or I.Q. There are three curves representing growth according to I.Q.'s of 70, 100, and 130. These are selected to represent mental growth at various rates or according to these three I.Q.'s.

It should be kept in mind that these curves represent averages. Curves for any given individual's growth would have the same general shape or pattern as represented by these curves, but not so regular or smooth and with some irregularities or variations. The variations or irregularities are caused by fluctuations in a person's performance on the test and by unreliability in the test, which shows up in testing a single individual but which tends to balance out when many are tested.

There are also actual, or true, variations in the mental growth of an individual. Nature follows a definite general course for almost every individual but does allow some fluctuation from that general course. So, keeping in mind that the curves in Fig. 8 are representative, let us examine them carefully.

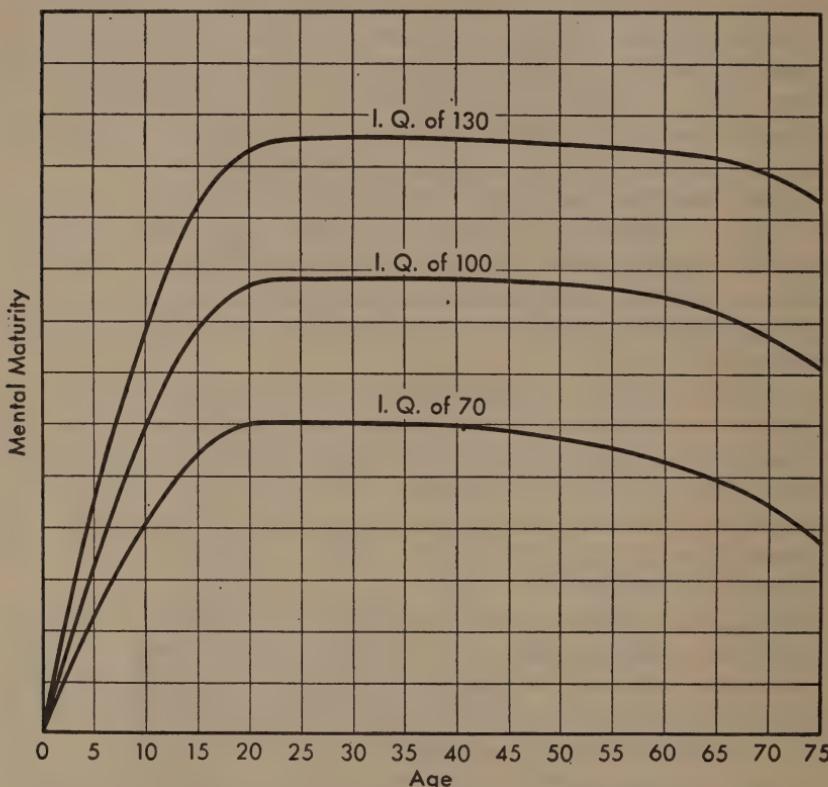


FIG. 8. Mental capacity from birth to old age according to intelligence quotient.

At birth, all children may be considered equal, as represented by the growth curves, which begin at the same point. Although infants can hardly be distinguished according to mental ability, they are not equal potentially and this is shown by the diverging of the curves. The rate of growth is represented by the curves which are classified according to I.Q. The mental age, or mental level at any given age, is also determined by the I.Q., which indicates the rate of mental growth.

The curve for persons with an I.Q. of 100 represents the average. In this figure the curve for an I.Q. above 100 is 130, and below 100 it is for an I.Q. of 70. When compared with the curve for an I.Q. of 100, the curves for I.Q.'s above and below become more meaningful. The facts on the nature of mental growth indicate that there is a little more mental growth in the first 5 years than between the ages of 5 and 10. It is evident that there is less between 10 and 15 than between 5 and 10, and mental growth between 15 and 20 is considerably less than growth between 10 and 15. The nature of growth for every I.Q. is essentially the same as that for the average except for at least two differences. Children with high I.Q.'s tend to grow comparatively faster and have a slightly longer period of development than do the dull. In other words, the very dull and feeble-minded tend to reach their limits slightly earlier than do the very bright. The differences in respect to the age when maturity is reached are not very great, but it probably is true that the development of the brighter continues a little longer than that of the less bright. In psychology, too, we learn that to him who has is given even more. This is relatively true and can be seen by examining the mental-growth curves for the various I.Q.'s, which in this instance range from 70, which is the upper I.Q. limit of a moron, to 130, which is the I.Q. for a person who has a high standing in any typical group of people. An I.Q. of 130 is the beginning of the classification designated as very superior.

Age When Mental Maturity Is Reached. By the age of mental maturity is meant the age at which natural mental growth stops. Just as there is an age when a person stops growing taller, there is also an age when a person grows no further in mental capacity. In a practical sense, it is the time when a person cannot increase his score on the general intelligence test. It is the age, according to Fig. 8, where the curves first reach their maximum height. Mental maturity is reached probably about or slightly after the time when the brain and the nerves leading to and from it cease to grow.

Various ages ranging from thirteen to the early twenties have been given as the age after which there is no further mental growth. Psychologists have found that with some groups with which they have experimented, and with the use of certain tests of mental ability, there is no increase in the score after ages fourteen, fifteen, or sixteen. As a consequence of these results, the psychologists doing the testing have concluded that mental growth stops at those ages. The same conclusion would be reached about physical maturity if it were discovered

that after these ages people could not run faster, lift heavier weights, jump farther, or increase in other motor or physical abilities.¹

During the First World War, 1917 to 1918, the mental abilities of American soldiers as measured by mental tests were equivalent to the abilities of American school children a little over thirteen years old. On the basis of this finding, it was concluded that mental maturity is reached on the average at thirteen and that no mental growth takes place after this age. Of course, the age of thirteen is not accurate, for there is considerable growth beyond this age.

It is probably safe to conclude that a person reaches his maximum mental level at about the age of twenty or perhaps a little before or a little after twenty. There no doubt are individual differences, some persons reaching mental maturity a little earlier and some a little later than others. It is true that on the average there is only a little mental growth during the late teens as measured by tests and shown by growth curves; nevertheless, this small amount may be very important. The measured growth from seventeen to eighteen is less than from seven to eight, but a little growth in the late teens may be just enough to enable a person to perform some tasks, say in college or on the job, that otherwise he could not.

Even though mental growth stops at twenty or thereabouts, it does not follow that educational growth need stop at that age. In fact, it is after a person has obtained his maximum mental power that he is best equipped for learning. It is then that he has most capacity for understanding facts and ideas and for thinking. It is then that a person studies for law and medicine; it is then that he masters his craft or learns a business.

Course of Mental Capacity after Maturity Is Reached. The course of mental capacity during the adult years has been the subject of many inquiries. Mental tests have been given to adults of all ages. Tests of learning have been given in order to test the learning ability of adults over a wide age range. Careful inquiries have been made about the age when the best books are written, when men are most inventive, when scientific discoveries are made, and when chess players become champions. If the age of great mental achievement is known, this should give some clue to the age when mental powers reach their acme.

Psychologists do not agree on the trend in mental capacity during adult years. There are some who believe that mental capacity tends

¹Of course, that has not been found with respect to physical abilities. It has been found that these abilities probably reach their maximum some time in the early or middle twenties.

to decline slowly after the early twenties, until old age is reached, when the decline is more rapid. According to this point of view, the curve representing mental power would be similar to that depicting the weight of the brain as given in Fig. 5 (page 14), except that decline in mental power is a little more rapid toward the end of life than is the loss of brain weight.

The contention that mental power starts declining after maturity is reached is hardly consistent with many important facts. Just as physical power does not reach its maximum as soon as a person reaches his full stature, so it is likely that full mental power is not reached at age twenty, when the nervous system seems to have reached its maximum growth. On the basis of the research findings on mental capacity and adult learning it can be stated, not too positively, it is true, but with considerable confidence, that mental power or capacity probably reaches its maximum at about the age of thirty-five. This is not to imply that there is much, if any, organic growth of the central nervous system which will cause an increase in basic intelligence or capacity between the ages of twenty and thirty-five. Whatever increase in intelligence or the ability to use intelligence may occur between the ages of twenty and thirty-five probably comes from experience and education. A person does much and learns much in the period when he is a young adult; he reaches a high point around thirty-five as a consequence or, shall we say, because of the cumulative effects of mental maturity and experience.

There is hardly any doubt that some time during the adult years, probably round forty, certain changes in the central nervous system and in the senses take effect and cause a decline in mental capacity to set in. The course of decline is not sharply downward but very gradual. There is considerable evidence that mental powers maintain themselves throughout the adult years surprisingly well for those who keep their minds vigorously active. In fact, the vocabulary and fund of general information may even increase throughout all but the last of adult life. The decline in most powers is not very rapid except during advanced years, when the infirmities of old age are present.

Education in Terms of Mental Growth and Decline. Psychologically and educationally, a knowledge of the course of mental growth and decline can be used to advantage by the teacher. By taking into account the mental maturing that takes place during the elementary and high-school years the curriculum and teaching can be adjusted to the learning ability or mental capacity of the pupil. This fact was also pointed out in the discussion of the growth of the brain (page 14).

Books that are too difficult for a child at six may be entirely suitable for his mental level at the age of eight. At six the child has no interest in a book because it is too hard; at eight he finds it interesting because, having reached a higher mental level, it is comparatively easy for him.

All curricular material can be graded according to mental level. The different materials in arithmetic are graded according to the learning ability of the students. If the beginning work in fractions is a little too hard for a child this year, he may be able to master it next year, and similarly with all kinds of learning materials.

It will be recalled that memory span and knowledge of words increase with age. This indicates that as the child grows older he gains in mental level; consequently, the subject matter becomes relatively easier because of an increase in mental power.

The mental level and mental capacity during the adult years are very favorable for adult education. To begin with, a person during his adult years, especially between the ages of twenty and forty, has his maximum mental power. It is then that he has reached his full mental maturity and can learn more effectively than ever before. If a person wishes to make the most of the powers inherited from his parents, grandparents, great-grandparents, and other ancestors, he should make the most of his growing years for developing good habits and acquiring attitudes, skills, and knowledge consistent with his physical and mental level and then during the adult years utilize his maximum capacity for becoming an educated and learned man.

It is during the twenties and thirties, the golden years of life, that a person usually gains or fails to gain competence and recognition in his field of work. It is during the twenties that a person educates himself for the professions of medicine, law, dentistry, teaching, ministry, engineering, etc.; and it is after he receives his professional degree that he either grows by studying and learning or deteriorates because of a failure to utilize his capacities in sustained study, exploration, and investigation.

The latter half of adult life is good, too, for then mental capacity is still high, although not quite so high as during the first half. Education should be a lifelong process. A person should acquire new ideas and new facts continuously, and he can do so during his forties, fifties, sixties, and seventies if he will only try. The capacity for learning is adequate during these years. It is largely a matter of desire and effort whether or not a person becomes better informed and more competent.

This also applies to the teacher. She is rightly concerned about her own success and happiness, and in part these depend on how she utilizes

her adult years, which are likewise her teaching years. The teacher, if she studies her subjects and her teaching methods, can increase in competence. She has the capacity to do so, and whether or not she does increase in competence depends on how she uses her time. By devoting a reasonable portion of her time to personal growth and professional development a teacher can develop greatly and achieve satisfaction and happiness. If she lets year after year go by without using her mentality fully, she will soon find herself in a deadening routine, out of date, without intellectual curiosity, and less happy than if she had utilized her adult mental capacities.

SUMMARY AND REVIEW

Comparable to the increase in physical power that accompanies general growth there is an increase in mental power that accompanies increase in age until maturity is reached. The nervous system grows, and this is the basis of increasing intelligence, which develops through education and experience.

One of the indexes to growth of intelligence is increase in vocabulary, which has two phases, words used and words correctly recognized. Increase in vocabulary, in general, is characteristic of the mental-growth curve and reaches its high point in the twenties, although it is possible that vocabulary ability increases slightly throughout most of adult life.

Memory, which is a basic element in intelligence, also develops steadily in a manner characteristic of mental growth and reaches maturity in the late teens or early twenties.

Another index to the development of intelligence is the development of thinking through the stages of enumeration, description, and interpretation. The teacher should be conscious of these stages and in teaching should try to stimulate the higher orders of thinking.

General mental growth is most rapid in the first 5 years of life, nearly as rapid from ages 5 to 10, less so from 10 to 15, and much less so from 15 to 20. Natural mental growth probably stops at about the age of 20. Bright children develop much faster than dull children and reach a much higher level at maturity. The bright probably develop over a little longer period than do the dull.

Of importance, too, is the course of mental capacity after adulthood is reached. Some studies indicate that, beginning in the late twenties, mental abilities decline; others, that mental capacity declines very little, if at all, until well past middle age. The golden years of life are probably the two decades from twenty to forty.

The adult years are good years for professional and personal development, and the teacher should capitalize on her adulthood to achieve maximum proficiency and usefulness.

Test Your Thinking

1. A person of twenty is dull and does not seem able to remember well or to think clearly. Discuss whether or not he will become significantly more intelligent as he grows older. Was he bright as a child?
2. During the childhood years, growth is learning's best friend. Discuss.
3. Some teachers call for facts and more facts, and the class period consists in reciting facts and figures. Some teachers encourage reasoning in the form of description and interpretation. Which teachers are cooperating best with Nature?
4. During what years of life do growth and development add most cubits to our intellectual stature?
5. At sunset the sun is not so bright as at midday. In the sunset of life the intellect is not so bright as in middle life, which is at the age of about thirty-five. Comment.
6. Of two ten-year-old children one has an I.Q. of 75 and the other an I.Q. of 140. What comparative mental levels will they reach as adults?
7. A psychologist said to a young man of 24: "Nature has stopped improving your nervous system, but you should make full use of the intellectual endowment you now have." Comment.
8. Two parents were discussing the education of their children. One parent said that on the average a child of ten can learn better than a person of twenty. The other parent said that the person of twenty is superior to the child of ten. What do you think?

References

- ANDERSON, J. E.: The Development of Spoken Language, *Yearbook of the National Society for the Study of Education*, 38 (Part 1): 211-224, 1938.
- BOYNTON, P. L.: The Relationship between Children's Tested Intelligence and Their Hobby Participations, *Journal of Genetic Psychology*, 58: 353-362, 1941.
- CONRAD, H. S., F. N. FREEMAN, and H. E. JONES: Differential Mental Growth, *Yearbook of the National Society for the Study of Education*, 43: 164-184, 1944.
- FINCH, F. H.: A Comparative Study of the Academic Ability of Students Attending a High School in 1923 and in 1942, *Psychological Bulletin*, 39: 432, 1942.
- GOODENOUGH, F. L., and K. M. MAUER: The Mental Growth of Children from Two to Fourteen Years; A Study of the Predictive Value of the Minnesota Preschool Scales, *University of Minnesota Child Welfare Monograph Series*, No. 20, 1942.
- HURLOCK, E. B.: *Child Development*, McGraw-Hill Book Company, Inc., New York, 1942.

- JERSILD, A. T., and R. RITZMAN: Aspects of Language Development: The Growth of Loquacity and Vocabulary, *Child Development*, **9**: 243-259, 1938.
- NAGGE, J. W.: Psychology of the Child; Mental and Physical Growth, The Ronald Press Company, New York, 1942.
- OJEMANN, R. H., K. C. GARRISON, and K. JENSEN: Mental Development from Birth to Maturity, *Review of Educational Research*, **11**: 502-530, 1941.
- SEEGERS, J. C.: Language Development and Meaning, *Review of Educational Research*, **13**: 102-109, 1943.
- SHOCK, N. W.: Physiological Factors in Mental Development, *Review of Educational Research*, **9**: 103-110, 1939.
- SHOCK, N. W., and H. E. JONES: Mental Development and Performance as Related to Physical and Physiological Factors, *Review of Educational Research*, **11**: 531-552, 1941.
- SMITH, MARY K.: Measurement of the Size of General English Vocabulary through the Elementary Grades and High School, *Genetic Psychology Monograph*, **24**: 311-345, 1941.
- TERMAN, L. M.: The Gifted Student and His Academic Environment, *School and Society*, **49**: 65-73, 1939.

CHAPTER III

SOCIAL GROWTH AND DEVELOPMENT

What to Look For. Be able to describe a person who is well developed socially and one who is not.

Be able to explain the relationship of age, physical maturity, and mental level to social development.

What experiences should a child have in order to develop socially? What experiences should be avoided?

Trace social development from infancy to adulthood.

Learn the facts about adolescence and delinquency or unsocial behavior. What are the symptoms of undesirable behavior?

Acquire the theories and facts about the teacher's procedures as conducive or not to the social development in her pupils.

Leadership is an evidence of social development. Learn what the characteristics of leaders are.

There are a number of factors that cause people to be friends. Learn how these factors influence the formation of friendships.

The topic of sociometrics is discussed. The term refers to social acceptance and rejection. The techniques of sociometrics are described, and what the teacher can do about the social pattern in her classroom is also described.

What are the characteristics of social maturity?

Introduction. A child of two will often say, "No! No!" to suggestions that he play some little game. Such a child is negativistic. But at twelve, when it is suggested that he take part in a game of baseball, he may join his fellows with great enthusiasm. He is no longer so negativistic, for he is maturing socially. As a grown person, he probably will cordially and pleasantly deal with his fellows at the desk, over the counter, on the street, in the field, or wherever he is thrown in contact with them. He has now grown up socially.

Meaning of Social Growth. By social growth and development we mean the increasing ability to get along well with oneself and others. The phrase refers to maturation of tastes, attitudes, interests, habits, and behavior in general. In childhood a girl will play with dolls and play house. If as a woman she continued such games, we should question her maturity. When grown up, she should have put away childish things.

In childhood we expect children to be dependent on their parents for almost hourly care. When they are growing up, this dependence should decrease. When they are grown-up, they must know how to take care of their own needs. They must be independent.

At birth and shortly thereafter a child pays little or no attention to anyone. At that time of life he is more individualistic and less social than at any other time. As he grows older, at about six months or a little later he begins to take interest in other children near him. At that stage, social behavior is beginning to show itself.

To illustrate further what is meant by social development let us consider the case of a young woman whose social behavior shows a high level of maturity. She cooperates with people rather than opposes them. She rarely, if ever, is bad-tempered, is always well mannered, is kind to people, is friendly, and consequently has friends.

She has good taste in art and in her reading and play activities. She can tell good color and design from poor, and she reads books of fiction, travel, and biography by the best authors. Her play and recreation are sensible and consist in dancing, cards, golf, "hiking," and activities suitable to her age and sex. She does not drink liquor in any form because its use is often not conducive to good social behavior.

The opposite of good social adjustment is illustrated by the young man who is shy and bashful. He avoids people when he can, for he is uncomfortable in their presence. He is dependent on his mother, relying on her for advice and companionship. It is said of him that he is tied to his mother's apron strings. As a boy, he played little with other children; people always regarded him as odd; and he never became sociable or friendly.

These are just two examples to illustrate social adjustment in one case and lack of it in another. There are many other elements involved in various degrees of social behavior; these elements will be mentioned later.

Social growth and development are not independent of other growth and of other characteristics. They are not separate from and independent of human development. On the contrary, they are related to and are in fact a part of physical growth, mental development, personality, the emotions, and mental health. In fact, social growth and development are largely a composite of all these factors. Therefore, social maturation has to be considered in terms of physical and mental status, personal qualities, and the emotions.

Social Development and Age. Children grow socially as they increase in age. A child of two reacts differently to people from the way he will when he becomes twenty. Some of the reasons for this change in

behavior are the growth of body size, growing mental power, and the cumulative experience a person acquires as he grows older. He learns to deal with people because as he grows older he has more experience in doing so.

Social Maturity, Physical Development, Mental Ability, and Experience. As a child grows older, he increases in both physical and mental stature until maturity is reached. Such growth can be represented by curves and charts, but the social development that takes place with the maturing of the individual cannot. The best we can do is to describe and discuss play interests, social activities, personal relationships, and other behavior that indicates social growth and development, or the ability to get along with others and to be happy.

A large, well-developed child tends to be more adequate socially than a smaller one, for the former can cope better with people and things. Being bright or having a mental age in advance of one's years also tends to make one more mature socially, for mental maturity beyond one's years also helps one get along better with people and things. Just as good physical and mental development usually contribute to social maturity, underdevelopment physically and mentally tends to retard a child socially.

Being considerably off size—too fat, too slim, too tall, or too short—often affects the personality adversely and may cause one to feel ill at ease in a group. Being called "Fatty," or "Skinny," or "Shorty," or other names may cause a child to feel inadequate. Such feelings retard social development.

Undersized children tend to play with children younger than themselves in order to achieve social adjustment. Larger children, especially if bright, can get along very well with children a little older than themselves.

Social development depends not alone on physical and mental development but also on experiences, on how one is taught, trained, and educated. For example, here is a girl who is bright, attractive, and well developed physically and who, one would think, would know how to deal with people very well. Nevertheless, she is socially inadequate, being unable to make friends among either boys or girls. She is an isolate, remaining alone while other young men and women of her age are together.

No explanation can be found for her social weakness except in her home training and experiences. Her mother pampered and spoiled her. She was a bright, attractive child, but her mother doted on her and "unsocialized" her, so to speak.

Here is another example. A bright boy of good appearance has been raised on a farm. He has lived apart from other children much of the time. In high school he walks down the hall, hardly looking right or left. There is nothing wrong with him physically or mentally—in fact, he is superior in both respects—but his home life on the farm during childhood and the experiences he had in a one-room rural school tended to make him shy and recessive.

Both this girl and boy have physical and mental advantages, but unsocializing experiences have left them inadequate in getting along with their fellows.

From Individualism to the Social Group. There is a gradual evolution in the person, from the extreme individualism of the infant and dependency on a few persons, largely the mother and father, to being socialized as a member of a group and usually depending on its many members. The individualistic infant, when nearly a year old, does pay some attention to other children of the same age to the extent of reaching out and taking hold of another child's foot or hair or arm or some other part of the body. If there are toys within reach, one-year-olds will often try to pull the toys toward themselves, and sometimes little children may be tugging on the same toy. But there is no evidence of sharing and cooperation at this time.

In the preschool age, children play together, the play being largely individualistic, with occasional examples of "you may have this" or "you may use this." There is, however, a strong tendency for some to dominate others. Definite evidence of ascendancy and leadership shows itself during the preschool years and even somewhat in early infancy, for some infants are more aggressive and assertive than others.

When children begin school, they enter an environment that tends to socialize them. They are members of a group, they work on projects together, and the games they play call for some teamwork. They borrow and share, and any antisocial and overindividualistic behavior is reproved by the teacher and frowned upon by fellow students. These are the experiences that cause children to become more group-minded.

In the intermediate, or middle, grades, groups and teams are formed. Children of these grades join girl and boy scout troops. The boys, especially, have their little neighborhood gangs, and they organize themselves into football and baseball teams. Extreme individualism has now been overcome by this banding together for work and play.

It is during the high-school age that boys and girls are more organized into teams and clubs than at any time previously. Boys have their football, basketball, and baseball teams, and both sexes have

their many school clubs. Just take a look at the high-school bulletin board, and see how the student council, the drama club, the literary organization, the religious group, and so on, have scheduled their meetings and how the members are urged to attend.

In connection with this socialization the fact must not be overlooked that during infancy and the preschool age and in the primary grades there is not much consciousness of sex. Boys and girls play together on equal terms. Shortly before puberty, boys become more conscious of girls but look down on them. It is "sissy" to play with girls, they feel, for they regard them as being of the weaker sex. During early adolescence, girls are fully up to boys in size and are more mature socially, for they reach puberty earlier. During adolescence a major problem in social adjustment and maturation is faced: boys and girls become interested in each other, seek each others' company, and have dates, and many romances begin. Boys and girls who are neither shy nor overaggressive, who know how to converse effectively and "get along" have achieved considerable social maturity.

During adulthood, social effectiveness continues to be as important for happy and successful living as it ever has been. Almost everyone has many face-to-face relationships with others every day. It is essential to be courteous and fair, to show no unpleasant feelings, and in general to be friendly. The person who does not get along with people or who is not socially mature will be unhappy.

In adulthood there is probably less social isolation than at any age. Men and women join in marriage and thus form the family unit. Business is organized into corporations and cooperatives. Churches, lodges, clubs, and societies are symbols of the social development of adults who are "joiners" and band together for security and for social purposes. Both children and adults are gregarious. They like to be together for the purpose of worshiping, doing business, playing, and visiting. In the process of growing up, we become social beings, finding many advantages in being together.

Adolescence, Independence, and Delinquency. As a child grows socially, he becomes more independent. During the teens, boys and girls tend to leave the parental roof, and in the late teens and early twenties they become self-supporting, marry, and establish their own homes. This is the normal order of events and represents good social development.

But an apparent by-product of this growing independence—this social development—is not good in that it is antisocial. This period of growing independence is marked by a great increase in delinquency

and crime. During the transition from childhood to adulthood and in the achieving of independence, there are those who show their independence by breaking laws and regulations. It is during the teens that antisocial behavior of a serious nature has its beginnings and even reaches very serious proportions.

We must hasten to say that most teen-agers are not delinquents or criminals and come through the turbulent teens with good records. However, many of those who become seriously antisocial do so before the age of twenty-one. *Delinquency* refers to behavior that is not good but is not bad enough to cause arrest. If a person is not delinquent by the time he is twenty-one years of age, the chance that he will ever be delinquent is only about 1 in 50. During the teen ages of thirteen to sixteen about half of all delinquency occurs.

When antisocial behavior is serious, arrest follows. Of first arrests, about 6 out of 10 take place during the teens. Almost 1 out of 4 takes place before the teens or at the ages of twelve and under. Of first arrests, only about 1 out of 7 takes place at the ages of twenty-one and over. It is apparent that delinquency and crime are like genius and promise—they show themselves early in life. Persons do not often become delinquent for the first time after twenty-one.

Crime is the field of the young. Of those brought to court, about one-fourth are under twenty-one, about one-half are under twenty-five, and nearly three-fourths are under thirty. In other words, about one-half of the arrested are in their twenties. Thus, serious antisocial behavior apparently has its beginnings before the age of twenty and becomes most frequent and serious in the twenties.

Just when and where antisocial behavior grows its roots, no one knows. The hereditarians say that the roots are in our parents, grandparents, etc. Other students of human behavior say that the roots of our behavior are nourished in the cradle. Others stress the pre-teen and teen ages, for it is then that the distortions of social development show themselves in the form of socially disapproved behavior.

One's point of view makes a difference in how he deals with a child and his social development; but, whatever one's point of view, he should work for the objective that during all ages of childhood a child should develop socially in desirable ways. A teacher should study the tendencies to behavior problems in his pupils and be on the lookout for extreme shyness and recessiveness and such behavior as stealing, lying, and breaking into buildings. He should try to apply remedial treatment through making school interesting to his pupils, by recreational programs, pointing out good and poor ways of behaving, and sometimes by

judicious punishment. His attitude should be not that of being against the child but that of wanting to help him.

The teacher should not be disturbed by whispering or by mischief and pranks. Often such behavior is the result of surplus energy and an alert mind. The teacher in such instances should be tolerant and should try to divert the child's activities into forms of leadership that will help the child and the school.

Education and training should not stop with attempts at keeping behavior from being antisocial. The development of good deportment is desirable, of course, but it is not enough. There should be a positive program. Manners, personality, gracious behavior, and in general the art of getting along with people should be made a special objective of the teacher and his pupils. At certain ages, we are satisfied if children are refined little savages. In their later teens, we expect them to be refined. That is the order of social development.

Schools and Social Development. Let us begin with a schoolroom where the teacher is an autocrat. She says to her pupils, "I'm the one who asks the questions, not you." The pupils are forced to sit rigidly still. If they show any evidence of curiosity, originality, or initiative, they are shooed back to the textbook where the assignment is to be found. The assignment usually consists of "the next 10 pages in the textbook," and at recitation time the teacher asks specific questions on details. She gives no opportunity for speculation or intellectual exploration. She centers attention always on the content of the book by questions designed to evoke answers in terms of what is in the book. She is especially pleased when the exact words of the text are used.

When it is time for the children to leave the room, they must first sit in rigid position and then, in response to signals by the teacher, they turn, stand, and pass. In passing the children are equally spaced and march in step. If they talk or whisper before they get out of the building, they will be punished by having to stay in during recess or after school or to write a hundred times, "I shall not talk or whisper when marching out of the building."

The reader no doubt sensed, after reading the first line of description of this teacher and her practices, that there can be little social development in a situation like this and that it is likely that antisocial attitudes and behavior will develop. But before going into this, let us consider another classroom.

Here the teacher is entirely different. She is not formal and unbending. Instead of confining the lesson to the next 10 pages in the textbook, she and the children work on topics or areas of learning. When

they take up the topic of American colonization, for example, the teacher and pupils together spend time in planning how they will study it and the teacher welcomes suggestions by the pupils. A list of references is similarly prepared, and when further study and illustrative materials are found they are added to the list.

The children work in groups, several children acting as leaders. They are encouraged to bring to school pictures, art objects, small pieces of furniture, and other material that helps them to understand more fully the colonists and their life. Before the class has finished studying this topic, there are many evidences in the room of their interest and work. Posters, murals, pictures, and collections are arranged to illustrate how the early American colonist adjusted to his environment. The pupils consult with persons in the community whose ancestors were colonists. They take trips to museums. They move about in a natural and informal manner. There are guidance and control, of course, but these are the outgrowth of group planning and organization, not of "strong-arm" methods applied by the teacher.

The descriptions of these two classrooms could, of course, be more detailed and more extended but are probably adequate to give an idea of the nature of the two teachers and their methods. The reader may ask if there actually are teachers like the unimaginative, formal, and formidable one first described. Oh, yes, there are—many, in fact, although it can be hopefully said that their number is decreasing. The number of teachers like the second—the classroom leader who worked cooperatively with her pupils—is increasing. Of course, teachers are distributed between the extremes in the extent to which they are dictatorial and coercive on the one hand or democratic and informal on the other.

The issue is the opportunity for social training afforded by the two situations. The classroom of the compulsion-type teacher furnishes the pupils no experiences in exchanging ideas, in consulting with each other, or in group work. Each child sits at his desk, and all intellectual and social traffic, limited as it is, is between the individual pupil and the teacher. Consequently, social development is at a minimum. There are, in fact, negative reactions. Children learn to be afraid and recessive and to think up artifices for pleasing the teacher.

In the second schoolroom the social situation is excellent. Children have an opportunity to confer with each other; they have experiences in give-and-take and in seeking cooperatively the answers to common problems. Individual children have an opportunity to exercise leadership. At one time, this child is the leader; at another time, another child

takes the initiative. In one situation a given child has more ability and interest and consequently is in the ascendant, the others responding to his leadership. And so it goes. The children are rubbing intellectual and emotional shoulders and are learning to work together in many situations.

Careful investigations have been made of the effects of these more modern methods on the learning abilities and personal characteristics of pupils. This topic will be discussed later at considerable length (page 415ff.); suffice it to say here that children educated in the type of school suggested by the description of the second teacher know better how to undertake problems, are able to get along better with their fellows, show more initiative, have better personalities, and are better adjusted.

Leadership. One evidence of social ability is leadership. It is usually the better adjusted socially, those who know how to get along with their fellows, who are selected as leaders of gangs, captains of teams, chairmen of clubs, or class presidents.

In early childhood there is little formal recognition of the leader. Children are not highly enough organized to select a captain or a president. A leader is selected when there are group organizations that require a leader. In childhood, some children are larger, stronger, and more assertive and have more ideas and thus gain a certain measure of ascendancy and control. The older children tend to be the leaders, for they are more likely to have those characteristics.

Leaders have certain qualities, varying according to the kind of group by which the leader is selected. The person selected as captain of a team is generally a player who, if not the best, is one of the best. In addition to the respect the players feel for the playing ability of the person they choose for captain, they generally regard him as being friendly and fair, a person whom they all like and with whom they can get along.

Class presidents and presidents of student councils tend to be above the average in size, although size is not an important factor in itself. It is also true that business executives, school superintendents, political leaders, and all in positions of leadership tend to be above average in size. There are many exceptions—size alone is a poor guarantee of leadership. Of much more importance as characteristics taken into account in the selection of class presidents and presidents of student councils are intelligence and scholarship. Students who are bright and have good marks are most likely to be selected. You can be reasonably sure that a dull student will not be selected as class president in a class where

the abilities of all the students are known. As is true in the selection of all leaders, friendliness and the ability to get along with people are major considerations.

A characteristic of leaders that is to be expected, since it is consistent with the very idea of leadership, is that they are extroverted. Just as we should expect to find that leaders usually have good personalities and are intelligent, so we should expect that they would be extroverted persons, that is, persons whose thoughts and interests center in others. Leaders have outgoing personalities. The person whose thoughts and interests are centered in self and who is self-conscious can hardly be a leader. Leadership falls to the person whose interests and thoughts go out to others and who likes to be with people. Such a person lives outside of himself, so to speak—in other words, is extroverted.

A willingness to work and the habit of industry constitute a very important factor in leadership. A lazy person is seldom selected. It is not the purpose of the author to moralize, but this is an opportune time to point out that leadership, like success in any field, is to be had only at the price of hard work. Talent and good ideas are barren if not nurtured and developed by sustained and often distasteful effort.

Among senior high-school and even junior high-school and grade-school children, socioeconomic status is taken into account in choosing a leader. Students with better clothes, more pocket money, parents with more education, and a better home have a prestige and standing that work to their advantage. A person having these advantages at least symbolizes leadership and therefore has a head start over a person of lower socioeconomic status.

All in all, the factors that make for leadership are good personality (being a "good fellow"), intelligence, size, success in a special field (athletics, art, or dramatics), being extroverted, being a hard worker, and good socioeconomic status. Most of these qualities or factors are usually found in the person who is a leader. In the first place, these qualities tend to go hand in hand. In other words, a person who is a good fellow is more likely than not to be intelligent, of good socioeconomic status, and a hard worker. Similarly, if you take a person with intelligence or socioeconomic status or any other of the above qualities, you will find that the other qualities tend to accompany that quality. In other words, they tend to appear in combination in the same person.

Friends and Friendship. During the first months of life a child shows little apparent interest in others. He seems bent only on eating and sleeping. The infant's problem is to survive and grow. But a child is growing into membership in a society, and thus he must become a

social being. He must learn to recognize people, to become acquainted with them, and to have friends.

During the second half of the first year the child seems conscious of infants of his own age who are in his presence. He soon learns to distinguish between his father and mother and learns to know what to expect from each, especially from the mother, who cares for his needs.

Social development and the making of friends is accelerated when children learn to talk and to understand what is said. Communication is the core of social relationships. When people speak with each other and have conversation, the beginnings of friendships are formed. The person who can speak well and express his thoughts and ideas has an advantage in making friends. The power of communication is, correspondingly, an important factor in leadership.

Figure 9 is a friendship sociogram for the members of a fourth grade, each of whom named three of her best friends and three whom she would not choose as friends.¹ The diagram shows the relationships between members of the class on the basis of selection, rejection, or being ignored. It should be analyzed carefully in order to understand the attitude and feeling of each child toward the others in terms of friendliness.

People have friends and companions. In fact, the capacity for friendship is a valid index to the level of a person's social development. We shall consider the factors that result in friendships. Specifically, why should Bob and Bill, Mary and Jane, Fred and Lillian be friends?

The factors that make for friendships are as follows:

Going to the same school.

Being in the same classroom.

Living in the same neighborhood.

Similarity in mental abilities.

Similarity in recreational interests—interest and ability in play, games, and recreation.

Similarity in age.

Similarity in socioeconomic status.

Similarity in religious background.

Similarity in type of character—*e.g.*, extroverts tend to select extroverts and introverts tend to select introverts as friends.

The factor of propinquity, or being near, is an obvious cause for the formation of friendships. Not all persons who are near each other in

¹The staff of the Division on Child Development and Teacher Personnel, American Council on Education, *Helping Teachers Understand Children*, p. 317, Washington, D.C., 1945.

one place or another become friends, but people cannot become friends unless they get a chance to see each other. Children of the same neighborhood, those who go to the same school and are in the same classroom are sure to get acquainted, and those who like each other become friends. A person's situation, the places where he finds himself are the places where he meets the people from whom he selects his friends. A person

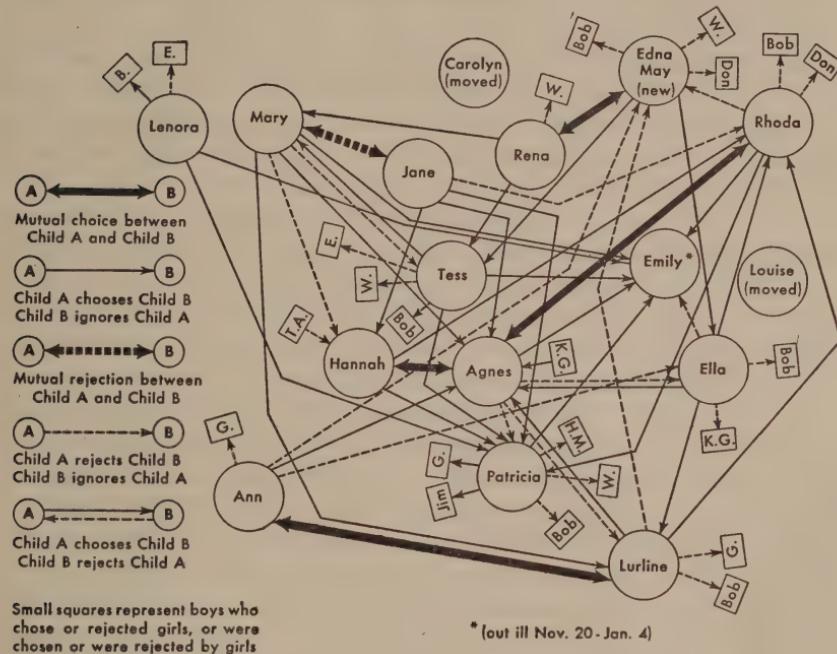


FIG. 9. Friendship sociogram. (*Courtesy of American Council of Education.*)

makes new friends as he grows older and finds himself in different situations, but he seems to remember always his school and neighborhood friends.

Besides propinquity, the other important factor in determining friendships is similarity. Birds of a feather flock together. Bright children tend to associate with bright, average with average, and dull with dull. It is rare that a bright child and a dull child are companions. They do not enjoy each other because they do not find each other interesting. Children of about the same chronological age and about the same brightness are "birds of a feather" and tend to be companions.

Age, of course, is a basic factor in friendship. Children of the same age tend to be the same size and in the same grade and to have the

same interests and the same mental development. There are wide ranges, of course, for each age; but, during the childhood, adolescent, and early adult years, companions usually differ very little in age. In the thirties and forties and at older ages, there is greater variation, though even then friends and companions usually differ little, chronologically.

In friendships and romances between the sexes the ages are usually about the same. Here, too, in the late teens and twenties there is a closer correspondence in age than later. Usually the young man is a year or two older than the young woman but often they are the same age, and in some instances the young woman is a little older. At the older ages a man may marry a woman considerably younger, and once in a while a man will marry a woman 10, 20, and more years older. This is considered unusual. Marriage should be regarded as a permanent companionship and partnership. Consequently, it is usually thought unwise for two people who vary much in age to marry, for they differ so much in their interests and abilities that the bond between them is affected. When the young wife wants to dance, the old husband wants to sit in the easy chair and read the newspaper.

One of the reasons advanced for not giving very bright children too much extra promotion is that they will then be in a grade with children three or four years older than they are. This would not be important in a graduate school, where, for example, a person of twenty-two may be in classes with persons of twenty-five, but it does matter in the seventh grade if children nine and ten years old are with children of twelve and thirteen. Very bright younger children can do the school work satisfactorily enough, but they are not big enough physically and old enough socially to cope with the larger, older children of their grade. Consequently, they are likely to develop attitudes of insecurity and inferiority that may handicap them socially as long as they live.

Persons of the same play and recreational interests and activities tend to be friends. We may ask the question whether people become friends because they play together or play together because they are friends. There is no doubt that each situation influences the other, but probably the cause-and-effect relationship in this instance is to be found in similar interests, which cause people to get together for their activities. Playing together at what they like—ball, cards, dancing, etc.—causes them to enjoy each other and thus develops friendship.

Because friends tend to have a common outlook and comparable mental abilities, it is not at all surprising that extroverts favor extroverts as friends and that introverts favor introverts. There is a theory, and

it is commonly held, that opposites attract each other. Of course, this is true in many instances, but more often it is the likes who attract each other. Friendship is based on common tastes and interests. Naturally, persons who are socially inclined and happy with people are likely to strike up friendships. Similarly, those who are less social and more retiring will find more satisfaction in each other.

Socioeconomic status refers to social and economic standing. A person who has high standing in the community and a good income and who lives in a well-furnished house of good quality and ample proportions is said to have good socioeconomic status, while a poorly educated day laborer of small income who lives in a small, dilapidated house in a section of town known as Shackville has low socioeconomic status. These are the extremes, and between these most persons can be classified.

Children and adults of the higher socioeconomic levels associate with others of the higher levels, those of the average levels with others of the average levels, and those of the low levels with others of the low levels. There are exceptions, of course, but society is so alert to observe the exceptions as to constitute a form of censorship causing a reduction in the number of exceptions that might occur.

Parents of children on the "right side of the tracks" discourage their children from striking up friendships among children on the wrong side. It is a rare mother or father of children usually dressed in clean, white collars and blouses, pressed trousers or dress, and shined shoes who is not upset when their children take up with some little ragamuffin.

It is not implied that there is a caste system based on socioeconomic levels. Nevertheless, income, position, social standing, the house and the part of town in which it is located—these are strong factors in determining a person's associates. It is the hope, of course, of American democracy that everyone has the opportunity to obtain a good education, to receive a position and income commensurate with his value, and thus to raise himself to a good socioeconomic level. Experience has proved thousands of times that people can change their socioeconomic levels from one extreme to the other in one generation and that social status is determined in a general way by individual merit.

It is unnecessary to say much about religious background and friendship except that the same principles apply as for other factors. Sharp differences in religious points of view are not conducive to friendship. Generally, Jews get along better with Jews, Catholics with Catholics, and Protestants with Protestants. Also, those who are conservative and orthodox have more in common with each other than they would have

with those who are progressive and modern in their religious points of view.

Here again we have a problem. People must learn to become sufficiently mature socially to be sympathetic with and tolerant of conflicting points of view. A socially mature person possesses the ability and has the habit of trying to be understanding of other people and their points of view.

Factors for Friendship Related to Chronological Age. Not all the factors mentioned influence the formation of friendships and social attitudes at all ages. In childhood, especially in earlier childhood, socioeconomic status and religious background play little or no part in influencing the development of friendships. Children are not conscious of these factors until taught by older children or, especially, by their parents. When they acquire prejudices from their parents or are taught that it reflects on their personal worth to associate with the "wrong" children, then are children influenced by the standing of other children's parents. Of course, we should hasten to add that parents should be careful to see that their children do not play with children who do not exert a good influence. This is only good sense. Parents can hardly be too vigilant in observing the companions of their children from this point of view.

Interrelation of Factors for Friendship. As with most factors, the factors for friendship are not separate or discrete, but related. For example, age between birth and twenty relates closely to mental abilities, for mental powers increase with an increase in age. From birth to death, play and recreational interests correspond to age. Boys in their teens play strenuous competitive games that are not played by men in their thirties and forties. There are sports, games, and recreation that are appropriate, within limits of course, to every age.

The neighborhood one lives in and socioeconomic status are related, for neighborhoods tend to be fairly homogeneous according to type of houses and education and vocations of persons living in them and also according to facilities such as parks, saloons, churches, and school grounds.

The school also tends to reflect the socioeconomic levels of its neighborhood and thus to characterize it. The better and more modern schools are more likely to be found in the newer districts of higher socioeconomic status and the older, poorer schools in districts of poor homes at lower socioeconomic levels.

In general, then, many of the factors and their influences in the making of friends tend to be interrelated. Consequently, it is rarely

one factor that influences the social development of a person, but several in combination.

The effect of the foregoing discussion of social development on the teacher should be to arouse her to an intelligent consciousness of why some children are leaders, why various children are friendly and others are not. The teacher may in her efforts to "put over" a subject or topic forget the social forces that influence the child. Sight must not be lost of the school's part in forming friendships and its opportunities for training leaders. The forces in school that make for good and poor social development should be differentiated. The teacher should be greatly concerned if a boy or girl is shy and retiring, if he does not seem to be conversing with his classmates, if a child walks down the hall without noticing his fellows. If a teacher is alert to the problem of social development, she can provide opportunity for conversation or a chance for leadership, can stimulate play during recess, and encourage wholesome activity.

Social Acceptability and Popularity. When a pupil is named by many classmates as a "best friend" or as someone that they would like to play and work with, this is evidence that such a pupil is popular and well accepted socially. On the other hand, those pupils who are thus chosen least often or not at all are least accepted by the group. Other evidences of friendship, popularity, and social acceptance are selection for class offices and other positions of leadership and the number of valentines and presents received.

In order to evaluate such popularity and social acceptability, pupils are asked to list the names of other pupils they would like to have work or play with them, go to a show with, stay at their house, or sit in the seat next to them. Selection on these bases and others similar to them indicates the extent of social acceptability of individual pupils. Pupils are also asked to name those they would not select. This method of measuring acceptance and rejection is called *sociometrics*.

Another method of getting an evaluation of pupils' social and personal characteristics is to use a "guess who" test. This consists of descriptions of people who are happy and unhappy, friendly and unfriendly, and so on. The descriptions are in pairs as indicated, and the pupils of a class name the pupils who fit the descriptions. When several children pick a classmate as having certain characteristics, it is probably a fact that such characteristics are true ones.

A teacher should study the personal qualities of her pupils and note the extent to which they are accepted or rejected, the extent of their popularity, and evidences of leadership. The teacher will also note the

social pattern of her class if she observes carefully. There are small cliques or groups within the class, and some children who do not belong to a group have very few, if any, friends. The teacher, if she studies the characteristics of her pupils and the social and economic forces to which each is subjected, may find some causes for the extent of their social acceptance or rejection.

A knowledge of certain factors related to popularity and social acceptance may help the teacher understand the social life of her pupils. Friendship and popularity tend to come to those who are cheerful, happy, enthusiastic, friendly, good-looking, and active, who enjoy a joke, and who initiate games and activities. The pupils who enjoy the friendship of their fellow pupils are extroverted and wholesomely aggressive socially. Friendship, it seems, is based on sound personal qualities and is not fostered by superficial tricks and artificially induced relationships.

There is some relationship between intelligence and social acceptance and between scholarship and social acceptance. The correlation is not high, but the children with most friends tend to have higher I.Q.'s and also higher achievement in school subjects. Although the average intelligence and achievement of the most popular are higher than those of the least popular, still there is considerable overlap in the I.Q.'s and achievement in the two groups.

The greatest change in the social interests of pupils which takes place from the fourth to the twelfth grade is the interest in members of the opposite sex. In the sixth grade, which is the prepubescent period, we have the gang age; at this time only about one-third of the boys and girls choose someone from the opposite sex. But in the twelfth grade about two-thirds of them do, and most of this change has taken place by the time the ninth grade has been reached. The social change exhibited follows closely the physiological changes that have taken place in the transition to adolescence. Girls change by being less interested in active games, but both boys and girls grow socially through their junior and senior high-school years.

Some Evidences of Social Maturity. Only a brief discussion of the symptoms or evidences of good social development will be presented here. The teacher should understand these symptoms, and she should be at least as conscious of the social development of her pupils as she is concerned about their learning of subject matter. She should also be concerned about her own social maturity, for she is the key person in developing the socializing forces of the classroom. Furthermore, if a teacher can achieve a high order of social maturity herself, which is

largely a matter of achieving a good personality, she achieves a fuller and happier life for herself, which is essential if she is going to do the same for her pupils.

Evidences of social maturity should be considered in terms of age. Some apply to all ages, but others are characteristics of certain ages. For example, in achieving social maturity, a time is reached when a person must become economically independent. He cannot always depend on his parents for support. Obviously, that time is not at the age of five or ten. At some time during the teens, however, persons either should become economically independent or should be preparing themselves for economic competence. Some qualities or habits should be characteristic of all ages. For example, the control of one's temper and other unbecoming emotions should be expected of persons of all ages.

The socially mature person

1. Has a capacity for friendship and rarely makes enemies. This capacity develops rapidly after language ability is acquired.

2. Has good control of his emotions, has a pleasant disposition, and a tolerant and understanding attitude, and rarely shows offensive feelings and emotions.

3. Has the power of leadership. Rudimentary forms are evident in early childhood, and this power becomes more articulate with increase in age.

4. Has the ability and desire to cooperate with others. Some are leaders in some activities, some in others, but all should cooperate with others and learn to follow good leadership.

5. Learns to become economically independent. In the teens a person should be acquiring his own economic wings and be able to earn his own living.

6. Becomes weaned away from the parental roof and establishes his own home and family. This parallels the achieving of economic independence.

7. Has play interests and engages in recreational activities suitable to his age—random activity in infancy; individual and imaginative play during early childhood; then individual play; strenuous team games during the pre-teens, the teens, and the twenties; and the recreational activities suitable to a person's health and age. During adulthood, a person plays to live and does not live to play.

8. Lives according to high social and moral standards and is not delinquent. During childhood and youth, delinquency increases with age and reaches its greatest frequency during the teens and twenties, after which it declines with age.

9. Is mannerly, courteous, and gentle in personal relationships. During childhood and the teens a tendency to be boisterous and of a rough-and-ready nature may be evident. During the later teens this surplus and randomly used energy is redirected, and the "roughneck" or tomboy tends to become a young gentleman or young lady.

SUMMARY AND REVIEW

Social growth consists in improving one's personal relationship, in learning how one gets along with people.

Physical and mental growth contribute to social development in that they enable a person to deal more effectively with social situations. Experiences in home and school are of great significance to social development.

A child is very individualistic in early childhood, but living with people socializes him so that he evolves from extreme individualism to a socialized person.

With the independence of adolescence there is a great incidence of delinquency, most of which manifests itself for the first time before the age of twenty-one, although crime and delinquency reach their high point in the twenties.

The old-fashioned question-and-answer type of teaching is not conducive to the social development of the child. Methods evoking co-operative effort socialize the pupil.

Leadership is an evidence of social maturity. School leaders tend to be students characterized by better scholarship, higher intelligence, more attractive physique, good work habits, success in extracurricular activities, and higher socioeconomic status.

A number of factors contribute to the formation of friendship, such as being in the same schoolroom and living in the same neighborhood. Personal factors are similarity of mental abilities, age, recreational interests, socioeconomic status, and religion. Also, extroverts favor extroverts, and introverts favor introverts. Several of these factors tend to be interrelated.

In school, children are accepted or rejected by others. Sociometrics is a method of measuring the social acceptance and rejection of children within a group or class. In some classes there are cliques. Some pupils enjoy wide acceptance; others are unpopular. The teacher should know the social pattern of her room and treat her pupils accordingly.

Persons are socially mature who can make friends, who are leaders, who have good emotional control, who cooperate with others, who become economically and socially independent, who have wholesome

recreational interests, who maintain high moral standards, and who have good manners.

Test Your Thinking

1. Describe the socially best developed person whom you know; the poorest developed.
2. A certain child is bright, is well developed physically, and has wholesome, well-adjusted parents. The child is likely to be well adjusted. Do you think this statement true or not?
3. "In order to get along in this world a person has to be individualistic and very aggressive. Being alone and working alone is best, for after all a person has to depend on himself." What do you think of this statement?
4. Knowing that the adolescent ages are the years when antisocial behavior seems to come to the front, what do you think can be done to bring about better social development of the adolescent?
5. Describe what you think is an ideal school for the social development of the pupils. What are the practices of a school that overlooks its opportunities to develop its pupils socially?
6. Take a sheet of paper, and draw a line down the middle of it. On the top of the left half, put down the name or names of one or more of the most prominent school leaders in your school. On the top of the right side put the names of those who show the least leadership. List the characteristics of each.
7. Do "birds of a feather flock together," or are unlikes attracted to each other?
8. Nancy and Bill are going together. Nancy is bright, likes to be with people, is a leader, has rich and well-educated parents, and appreciates her church experiences. Bill is rather dull; he says he likes to be with Nancy alone and does not care to be with other people; his socioeconomic status is low; and he does not care for church. They are likely to become very good friends and then fall in love and stay in love forever. Do you think this statement true or not?
9. Why do people who associate with each other extensively tend to be of the same age?
10. Some children in a classroom are popular. Others are neutral in their appeal to others, while some tend to be rejected. What problems result, and what can be done about them?

References

- ANDERSON, J. E.: The Development of Social Behavior, *American Journal of Sociology*, 44: 839-857, 1939.
- BENTLEY, J. E.: *Superior Children; Their Physiological, Psychological and Social Development*, W. W. Norton & Company, New York, 1937.
- BONNEY, MERL E.: Personality Traits of Socially Successful and Socially Unsuccessful Children, *Journal of Educational Psychology*, 34: 449-472, 1943.

- BONNEY, MERL E.: The Relative Stability of Social, Intellectual, and Academic Status in Grades II to IV, and the Inter-relationships between These Various Forms of Growth, *Journal of Educational Psychology*, **34**: 88-102, 1943.
- COLE, LUELLA: *Psychology of Adolescence*, Rinehart & Company, Inc., New York, 1936.
- DRAKE, R. M.: A Study of Leadership, *Character and Personality*, **12**: 285-289, 1944.
- ENGLE, THELBURN L.: A Study of the Effects of School Acceleration upon the Personality and Social Adjustments of High-school and University Students, *Journal of Educational Psychology*, **29**: 532-539, 1938.
- GLUECK, SHELDON, and ELEANOR T. GLUECK: *500 Criminal Careers*, Alfred A. Knopf, Inc., New York, 1930.
- HUNTER, E. C., and A. M. JORDAN: An Analysis of Qualities Associated with Leadership among College Students, *Journal of Educational Psychology*, **30**: 497-509, 1939.
- JONES, HAROLD E.: *Development in Adolescence*, D. Appleton-Century Company, Inc., New York, 1943.
- KUHLEN, RAYMOND G., and BEATRICE J. LEE: Personality Characteristics and Social Acceptability in Adolescence, *Journal of Educational Psychology*, **34**: 321-340, 1943.
- LEEVY, J. ROY: Social Competence of High-school Youth, *School Review*, **51**: 342-347, 1943.
- LEHMAN, H. C., and P. A. WITTY: *The Psychology of Play Activities*, A. S. Barnes and Company, New York, 1927.
- LUCINA, M.: Sex Differences in Adolescent Attitudes toward Best Friends, *School Review*, **48**: 512-516, 1940.
- MCGEHEE, WILLIAM: Changes in Interest with Changes in Grade Status of Elementary School Children, *Journal of Educational Psychology*, **32**: 151-156, 1941.
- PECHSTEIN, L. A., and MERTON D. MUNN: The Measurement of Social Maturity in Children, *Elementary School Journal*, **40**: 113-123, 1939.
- PINTNER, R., G. FORLANO, and H. FREEDMAN: Personality and Attitudinal Similarity among Classroom Friends, *Journal of Applied Psychology*, **21**: 48-65, 1937.
- REYNOLDS, F. J.: Factors of Leadership among Seniors of Central High School, Tulsa, Oklahoma, *Journal of Educational Research*, **37**: 356-361, 1944.
- ROSANDER, A. C.: Age and Sex Patterns of Social Attitudes, *Journal of Psychology*, **30**: 481-496, 1939.
- SHALLOO, J. P.: Youth and Crime, *Annals of the American Academy of Political and Social Science*, **194**: 79-86, 1937.
- SHAW, C. R., H. D. MCKAY, and others: *Juvenile Delinquency and Urban Areas*, University of Chicago Press, Chicago, 1942.
- Staff of the Division on Child Development and Teacher Personnel, *Helping*

- Teachers Understand Children*, American Council on Education, Washington, D.C., 1945.
- SULLENGER, T. E.: *Social Determinants in Juvenile Delinquency*, John Wiley & Sons, Inc., New York, 1936.
- THRASHER, FREDERIC M.: *The Gang*, University of Chicago Press, Chicago, 1936.
- TROW, W. C.: Educational Psychology—Individual or Social? *Journal of Consulting Psychology*, 5: 265-269, 1941.
- TURNEY, A. H., and FLOYD I. COLLINS: An Experiment in Improving the Personality of High School Seniors, *Journal of Educational Psychology*, 31: 550-553, 1940.
- WEITZMAN, ELLIS: A Study of Social Maturity in Persons Sixteen through Twenty-four Years of Age, *Journal of Genetic Psychology*, 64: 37-66, 1944.
- WHITE, M. A., and H. M. WILLIAMS: The Approach-Withdrawal Pattern in the Social Behavior of Young Children, *Journal of Genetic Psychology*, 54: 73-84, 1939.
- WILSON, F. T.: Expressed Wishes of Elderly Persons, College Men, and Birthday Wishes of First Grade Children, *Journal of Genetic Psychology*, 55: 81-101, 1939.
- YOUNG, LYLE L., and DAN H. COOPER: Some Factors Associated with Popularity, *Journal of Educational Psychology*, 35: 513-535, 1944.
- ZELENY, L. D.: Characteristics of Group Leaders, *Social Research*, 24: 140-149, 1939.

CHAPTER IV

OUR WANTS, DRIVES, AND URGES

What to Look For. In this chapter are described the human forces that account for our behaving the way we do. Be able to describe and illustrate these various drives and urges. Try to show how the teacher can appeal to these wants in order to deal effectively with pupils and with others.

Note the three phases of the want for security: (1) security of life; (2) security in living; (3) security with people.

Observe how the want for personal worth may lead to both desirable and undesirable behavior.

Considerable discussion is devoted to how pleasure and pain influence and control human behavior.

The organism craves stimulation and action. Note how the school should work with "nature" and not against it.

The desire for individuality and the want for freedom are closely related. The reader should learn how the school can satisfy these wants.

Sex interest is discussed. The reader should try to understand it as a force for good and also as a force that is often misdirected.

Comprehend how a failure to satisfy the basic urges causes unhappiness and maladjustment. Note how feelings and emotions are related to the basic urges and that they have a physiological basis.

The endocrine glands are discussed in relation to growth, emotions, and behavior. Learn the names of the endocrine glands and how they function.

Introduction. Have you wondered why every pupil wants the approval of teacher and classmates?

James threw his cap on the davenport and exclaimed, "We don't do anything in school—we just sit there, and teacher does all the talking."

When asked why he was going to school, Fred said that he "wanted to be prepared so he could hold a good position and make a good living."

Most high-school girls when asked in conference or questionnaire what they want to do when they finish their formal education say that they want to get married and have a home.

Boys and girls of high-school and college age like to be paired off together and alone.

And you hear so often, "I don't like that person because he is unpleasant"; "I like a climate that is stimulating and comfortable"; "I've got to do something to get rid of this painful headache."

All these facts and statements reflect basic wants and needs and indicate some of the human urges and drives that account for human behavior and emotions.

Pupils in and out of school behave as they do and experience emotions and have various feelings because of certain wants, drives, and urges. If a teacher knows these springs to action or basic wants, she can understand the behavior of people and can utilize this information in dealing more effectively not only with her pupils but with all the persons with whom she comes in contact. Her methods can be in harmony with the wants and drives that underlie human behavior, and her pupils can be guided to learn more and to be more successful and better adjusted human beings.

The Want for Security. There are three aspects of the security that we want: (1) keeping alive, or security of life; (2) economic security; (3) social security.

1. *The Want to Live (Security of Life).* Except for the few who have been badly defeated by life, everyone wants to stay alive. We are terribly afraid when our life is threatened. When seriously ill, we are greatly concerned about getting well because we do not want to die. We go to war in order to defend the lives of our loved ones, and those in battle experience the fear of being killed.

This strong urge to live has been called the *instinct of self-preservation* —the instinct to preserve oneself, or to keep on living.

One of the appeals of health and physical education is the appeal of freedom from illness and the prolongation of life. We appeal to children to keep clean in order to avoid infection, to eat good food because thus they will feel better and live longer, and to avoid tobacco and liquor because these can cause illness and shorten life. We appeal to the desire for a painless and long life.

One of the basic appeals of religion is everlasting life. Our physical death is merely a transition to the next world, where we achieve all our fundamental wants for a great joy and freedom from pain. Of course, if one is damned, his hereafter is a never-ending life of pain and unhappiness.

2. *The Want for Economic Security.* People desire to earn good wages and have adequate incomes so that they will be secure eco-

nomically. We want enough money so that we can have good food, clothing, and shelter. People save money in order to have security in their old age, when their earning power has been lost.

When children are asked why they go to school and why they want to get good marks in school, they say that an education will help them get a better job and that if their marks are good they will get a better recommendation from their teachers and principals.

Economic security makes people feel better and happier and consequently has a good influence on children's personalities. The children of parents who hardly know where the next month's rent is coming from, whose grocery bill is getting so large that the grocer threatens to discontinue credit, and who can afford only old, badly worn clothes for their family—such children often have personalities that are distorted with fears, worries, and inferiority complexes. In trying to understand a pupil the teacher should look into the economic conditions of the home, for it is there that some of the explanations of a child's personality and behavior may be found.

3. *The Want for Social Security.* By the want for social security we mean the want for friends and companionship and the desire to be with other people. All but the extremely unusual or abnormal want to be with other people. This desire to be in a circle of friends or in a group, audience, or crowd is called *gregariousness*.

Connected with this is our desire to be liked by others. We want to be thought well of, and we are deeply concerned about what others think of us. Children want to be known, want to be members of a gang or "bunch." People join fraternities, clubs, unions, churches, orders, and so on, for social security and for economic security, also, in many instances.

In the school the teacher can make many appeals to the want for social security. She can build up the feeling that the class is a good class, that it is a good group, and that the school is a good school. Pupil morale and school spirit have their roots in group, or social, security.

Pupils want to be respected members of their classes. They want the approval and friendship of their teacher and also the approval and friendship of their classmates. Each pupil wants the feeling of security of being an active and successful member of his group.

The teacher, too, should want the friendship and approval of her pupils. Her personal relationships with her pupils should be so successful that she has their good will and confidence. Such a relationship gives the teacher a feeling of social security, and this is conducive to good teaching and happy living.

The school that contributes most to social security is the school where instruction is socialized, as differentiated from instruction that barricades the pupil in his own seat, where he has little or no intellectual and personal exchange with his fellow students but studies the teacher's lessons and answers the teacher's questions. In the socialized classroom there are group planning and discussion, committee work, excursions, games, and group projects. Then a student gets the "feel" of the group, an experience that is good for him and that he likes because of the want for social security.

The appeal to the "socialness" of students can be made through a rich extracurricular program of sports, parties, school government, forensics, drama, and journalism. That these activities make an appeal to the desire to participate in group activity and thus to achieve social security is not so important as the fact that, by participation, better personalities are developed and thus the firmest basis for social security is obtained.

Before going on to a statement and explanation of the other wants, needs, and drives, it must be pointed out and emphasized that all of them are closely related and similar in many ways. The wants and urges have common elements and are similar in several respects, as has already been made evident in the discussion of the three aspects of security and as will be even more evident in what follows.

The Desire for Personal Worth—Ego Value. Every human being wants to have a feeling of personal worth; he wants to have recognition, to be well thought of, and to have standing.

When Mr. Opulence buys a large, expensive car, he does so not only for the extra riding comfort such a car gives him. He wants the admiring attention of people who see him in the car; he wants the prestige and attention that the ownership of a big, expensive car gives.

The whole motive for "keeping up with the Joneses" is to have prestige and maintain a feeling of worth.

The child in the cradle wants attention. If attention is given someone else in his presence, even a young child will "carry on" in order to receive attention.

When children begin school, they seek the approbation of teachers and fellow pupils. They like to have their work displayed from the wall; they aspire for gold stars, and aspire for standing.

All through life, people seek rewards, prizes, and recognition. Many want to be leaders because leadership has ego value. We like praise and recognition that enhance our value of self, or increase our self-esteem.

A feeling of value or importance makes us feel happy and a feeling of

unworthiness or inferiority makes us unhappy. Just as in the physical world nature abhors a vacuum, so in the psychological world human nature abhors a feeling of inferiority. We are willing to work hard to achieve a feeling of worth.

Much of human behavior and feelings can be explained in terms of this prevailing human want for a feeling of importance—this strong urge for ego value, or the worthiness of self. To ourselves each of us is a very important person.

The teacher can capitalize on this strong urge in helping the student with his personal problems. If a student is failing in his work or has not the standing with his classmates that he would like, the teacher should understand that what he needs is some success and a chance to show some leadership. She should try to find out what his home is like. She may find it a place blighted by poverty or one where mother and father are incompatible or where there has been a divorce. The child may feel that he is not wanted by his parents; this makes him feel insecure and also lessens his feeling of worth.

In the schoolroom the pupils are benefited most when there is a constructive or positive atmosphere, for then the appeal is made to their desire for individual personal worth. A feeling of personal worth cannot be obtained fraudulently; it must be obtained through achievement or improvement. When a teacher sees a child trying especially hard, when one pupil has an especially good idea, or when another has done extra work or has an especially good lesson, she should be alert to award recognition through special mention or praise.

In general, some wants are satisfied and the child is bettered by group experience, but the want for personal worth is individualistic and private, so to speak. The want for worth can be satisfied in the group and by group activity, but the feeling is individualistic, for it involves the self largely.

The means used by teachers and the school to motivate the child, such as prizes, praise, school marks, honor rolls, being made a leader, being at the head of the class, being chosen for the team, and other recognitions, appeal to the feeling of worth. They also give a feeling of security, which in turn contributes to a feeling of worth.

Of course, care needs to be exercised in any appeal to the feeling of worth lest a child become egotistical or conceited. It is well to achieve a healthy feeling of worth or importance, but such a feeling, if too strong, invades the feelings of other people and generates antagonism. Everyone should feel worthy, but accompanying this should be a modesty that invites the good will of others.

The Want for Pleasure and Satisfaction and the Avoidance of Pain.

To a large extent our course through life is one in which we try to move in the path of pleasure and avoid pain. We seek out people who are pleasant and cordial, and we avoid those who are unpleasant and whom we do not like. Much of the boy-girl, man-woman relationship is determined by pleasure and happiness, and it is unhappiness and pain that spoil the relationship for many. People devote almost unlimited time and money seeking pleasure and happiness, so much so that the entertainment business is one of the biggest in the world. People spend billions for motion pictures, concerts, ball games, horse races, hunting, motoring, and traveling in the pursuit of pleasure. If we add to this the amount spent for medical and dental treatment to eliminate pain, the total becomes almost unbelievably large.

We try to live so that we feel well and so that we will not suffer pain. In actual fact, bodily pain is a great friend, for it tells us we are not living right and that correction is due. Some pain is unavoidable, of course, for no matter how hard we try there is some illness or injury that we cannot escape.

One of the principles of learning is that we learn that which gives us pleasure and satisfaction and not that which gives us pain. In a broad sense this is a fundamental truth, for survival or life itself is cradled and nurtured by satisfaction and happiness, while pain and discomfort are associated and have cause-and-effect relationships with a shorter life and death. Pleasure and pain, happiness and unhappiness are not unmixed. People will work and fight hard to prepare for a vocation, and they will do the same at their work, but they do so to attain satisfaction, happiness, and security. We soon learn what it is that gives us pleasure. Consequently, we may acquire a taste for that which is not good, such as resting too much, "loafing," or too many sweets or too much liquor, because such indulgence is pleasant even though the larger effects are not pleasant. In such instances a person must be willing to sacrifice immediate pleasures for the later or more permanent happiness that is likely to follow.

The teacher can make extensive use of the human desire for satisfaction and happiness and the aversion for pain in dealing with her pupils. Furthermore, she herself can and should achieve happiness and great satisfaction in her teaching. If she does not do so, she should examine the value of her work. If she is not achieving success and happiness for herself, it is doubtful that she is achieving much success and happiness for her pupils.

Furthermore, pupils, if they are to do their best work, need to be

happy and feel satisfied about what they are doing. Students should like school. Any class or grade or school that does not appeal to its students is probably not successful. It does not follow that school must be "a picnic"; it would not satisfy the students if it were. But if students dislike school or are unhappy about it, they will not achieve as much as they are able to and when they are old enough they will leave.

The teacher again can use satisfaction and dissatisfaction, pleasure and pain, happiness and discomfort in order to stimulate the development of her pupils. Just saying "Right" and "Good" or "Wrong" and "Incorrect" tends to fix what should be learned and to eliminate errors and mistakes. By praise, the appeal is to the desire for satisfaction. By reproof, the pupil tends to do better in order to avoid unhappiness or discomfort.

Mutual good will of teacher and pupil creates a happy, satisfying situation. In fact, interest in a subject or in schoolwork as a whole depends to a considerable extent on the pupil's feeling toward the teacher and the teacher's toward the pupil. If teachers like their pupils and pupils like their teachers, the pleasantness and happiness in such a situation are conducive to the better mental health of both groups and also to better learning and a permanent interest in the subjects studied.

In the old school, pupils were punished freely with whip and tongue in the belief that pain would deter them from doing what they should not do and spur them on to do what they should do. This approach, however, was largely negative. Pupils were punished not only for doing wrong or breaking the many rules of the school but also for failing to do their lessons as well as the teacher expected.

As is true of any rudimentary methods the severe methods of the last century were never effective. The schools have now been humanized. The teacher "accentuates the positive." But there is still place for pain in the education and training of pupils. Therefore, when a child deliberately ignores the best interests of the group and his own too, he should feel the pain of being denied some trust and freedom or should be reproved or otherwise recognized unfavorably. Such a procedure must be handled carefully so that the pupil gets no prestige out of being what may seem to be out of order with the teacher. If he gets ego value out of the situation, he may be achieving the attention he wants. Consequently, it is important that there be good morale in the class. The feeling that the class is the pupils', not the teacher's, will do much to keep the individual pupil a good citizen. There is hardly any pain that a pupil dreads more than the reproof or rejection of his class or group.

The attitude of his classmates will do more to govern a pupil than probably any other force or influence.

The Want, or Desire, for Stimulation and Activity. We like to be in a situation where there is "something doing," as we say. We like to be stimulated; to see people, things, and interesting action such as races and games; to hear music, speeches, and conversation; to feel the presence of others; to feel a warm sun and a soothing breeze; and we like to taste, to eat, and to drink.

We not only want to be stimulated pleasantly through our senses—we want to be in action ourselves. We crave to be up and doing. We want to be with people and talk to them; we want to play games, to dance; we want to be on the move, walking or riding. We crave action.

The human organism grows and develops through stimulation and action. We learn by doing, but we also learn because of what we see, hear, feel, taste, and so on. In our living and in our growing and developing, there must be a taking in, psychologically speaking, and there must be a giving out. For example, solitary confinement, which limits this take-and-give process, is most abnormal for the human being and consequently a severe punishment.

Children have more urge for stimulation and action than those of any other age group. This urge or drive cannot be suppressed. The school should utilize it and work with it rather than against it. If teaching is reasonably interesting, children will pay attention. If what they are doing stimulates them, they are going to be completely absorbed in the lessons, projects, or activities that are making a bid for their attention.

Because children have a tremendous urge for action and for doing, as has everyone except the ailing, crippled, and old, they should not be expected to sit rigidly in their seats for long periods. The schedule should be organized so that they can work in groups, so that there is educational handwork, so that they can talk and participate in discussion, play games, and work at the blackboard.

Teachers are inclined to judge their own effectiveness by the amount of information they present, by the talking they do, and in general by the extent of their own performance. The criterion of good teaching is not so much this as the intensity and extensivity of the action of the pupils. The teacher's tendency to do all the performing is consistent with the urge to be doing, but she should redirect that urge so that it will be the pupils who will be most active.

In the old school, an attempt was made to repress this craving for

activity. The result was that the children were always annoying the teacher with their restlessness and would often break out into the more dramatic forms of pranks and mischief. The fact is that children cannot be repressed. This does not mean that they cannot or should not be controlled but that it is best to utilize their want to be stimulated and to be doing.

In stimulating them, audiovisual aids make an appeal. The use of films, both sound and silent, slides, radio, phonograph, demonstration apparatus, objects, things, and materials satisfies the natural wants of children and contributes to effective teaching.

In the typical school, physical education and especially athletics are stressed in the high school. Without minimizing physical education at any level, we may say that it is most suitable to stress physical education in the lower grades. It is then that children are growing and developing at a rapid pace and consequently need the corrective and preventative experiences of good physical education and the satisfaction of their craving for action.

Thus, in human beings there exist a strong need and urge for action. These cannot be repressed. Education should utilize them in group projects, discussion, manual acts, physical education, and excursions, for the maximum growth and development of the students.

The Want or Urge for Freedom. When an infant or young child is held firmly so that he cannot move, he will cry and struggle to be free. He resists restraint. The line in a popular song of a few years ago, "Don't fence me in," expresses in a sense the feeling of most people. We do not wish to be unduly restrained, fenced in, or repressed.

In a way, this desire for freedom is influenced by the wants for ego value, for activity, and for pleasure and the avoidance of pain, for a repressed person feels less worthy, his activity is restrained, and his experiences are made less pleasant. In hardly any instance, however, are the human wants and urges separate and independent from each other. The child or adult does not want freedom without control and law; he wants a freedom that allows him to live ethically the best kind of life he is able to live.

Thus, in school, children want the right to do their own thinking and to express themselves freely. They do not like to be governed by rules and regulations whose purpose they do not understand. But fundamentally neither do they like a school where there is so much freedom that there is disorder. They find fault with a teacher in whose room the children are disorderly. They also find fault with teachers who are unimaginative and too rigid and who cannot enjoy a joke.

Apparently a schoolroom and school where behavior is governed largely by understanding and good will afford the freedom that is most satisfying to both pupils and teachers.

Correlated with the urge for freedom is the desire of people to have freedom under laws and regulations of their own making. This desire is satisfied in the school by student government. Obviously, in the lower grades, children are hardly capable of self-government, though even there they can express themselves about what they would like to do and how it should be done. Even in the third and fourth grades, pupils can hold meetings, conduct business, make motions, and pass rules and regulations.

What has been said above about repressing activity applies to freedom also, for the two are closely related. Children want freedom, as do adults, and they chafe under many restrictions, such as the requirement that they sit stiffly in their seats, keep silent except when they answer the teacher, and march in and out of the schoolroom in formal fashion. In the schoolroom as in a state or nation, government is best that governs least.

The Want for Sexual Stimulation—The Sexual Urge. Through most of life, human beings experience sex feelings of one kind or another. Sex feelings are not limited to the postpuberty age but are had by children of practically all ages. There are great individual differences, of course, but the sex urge and the desire to have sex experience constitute a dominant factor in human behavior.

This serves the purpose of propagating the race and thus fits into a great plan of Nature. It is a fundamental drive and urge, underlying love and controlling many human relationships.

Most schools are coeducational. Boys and girls from kindergarten through college are together in schoolrooms and on school grounds. They play and work together and are school rivals, too. In the school there are many opportunities to develop wholesome attitudes and relationships between the sexes. Boys and girls get accustomed to each other by being in school together, and this is good. They associate with each other at school games, parties, and dances, and this is conducive to boys and girls understanding each other.

Because sex is such an important aspect of life, the more alert schools offer sex education to their students. Through acquainting the students with the facts about sex—its physiology, sociology, psychology, and morale—ignorance and morbid curiosity will be overcome. Experience has shown that such sex education results in better behavior.

The teacher should recognize the importance of boy-girl relationships

and realize that behind some of them at least and probably behind many of them is a fundamental biological urge. She should be sympathetic and understanding and try to guide her students toward good behavior and high idealism.

THE BASIC URGES, MENTAL HEALTH, AND HUMAN ADJUSTMENT

Some fundamental basic needs, wants, urges, desires, and cravings have been described. Without these there would be no human beings, for there would be no forces to keep them in existence. Or if human beings did exist without these urges, which is hard to conceive, they would be most uninteresting and unmotivated creatures. As the human being with these urges tries to make the best possible adjustment to his environment, various frustrations, conflicts, and other maladjustments develop.

If in our environment we get along well with people, have good jobs and make plenty of money, are married to the right persons, have a variety of interesting experiences, are in good health, and are free from undue restraint, we are likely to be happy and wholesome people. Our wants, urges, and desires will be satisfied; we shall have a feeling of security; there will be good sexual adjustment; life will not be dull; our desire for stimulating experiences will be satisfied. There will be comparatively little pain; life will be comfortable; and freedom will be enjoyed. And with all these satisfactions will go the feeling of personal worth, of satisfactory ego value.

An individual who has such experiences will be well adjusted, and his mental hygiene will be good. His emotions will be wholesome because he will not have fears about insecurity; he will not worry unduly about how he is getting along; he need not be jealous of others or feel much hate. He need not be jealous, for he is getting along very well; he need not hate, for he is getting what he wants in life. He will love and be loved; he will like people; he will be unlikely to become angry very often or be unhappy.

Thus our happiness or unhappiness, or our mental hygiene, is dependent largely on the extent to which our urges, cravings, needs, wants, and desires are satisfied. If they are wholesomely satisfied, then we are well adjusted; if not, we become maladjusted.

Let us consider some examples. Here is a young man who wants to get married. He spends much time with a girl who is the object of his attraction. He tries to gain her love. Although at times he seems to succeed, at the end of 2 years he learns with bitterness that he has failed. His association with the young woman is terminated.

He feels frustrated and thwarted. He has not obtained what he wanted—the happiness of living with the young woman he loved. He had responded to the common urge, the desire to mate with a member of the other sex and establish a home together. His pride, or his feeling of worth, has been injured, too.

He is thus unhappy about his frustration or his defeat. Then he develops hate for and jealousy of a young man who does succeed in marrying the young woman with whom he has failed. Now he harbors his feeling of failure and unhappiness and his emotions of jealousy and hate. He hides them away, or represses them. His behavior may at times seem odd. He may be sensitive or may tend to become angry. The reason is that he has within him, harbored in his nervous system and glands and body chemistry, these feelings and emotions. His behavior is likely to become unfriendly. As a result of his emotions and behavior his mental hygiene is poor.

Again, here is a child brought up in a home where the mother and father do not get along but quarrel and fight. Because of the unhappiness in the home the child is unhappy, too. He feels insecure because he lives in an insecure home. He does not have the security that a child feels in a home where parents love each other and love their children. In the breaking and broken home the children usually feel unwanted. This lowers their self-esteem, causes them to feel of less importance, and gives them feelings of inferiority. This unhappiness governs their behavior, and they will do things to gain attention, worth, and social security. They will strike out for happiness. In doing so they may become delinquents. You have in this explanation the reason why such a large proportion of delinquents come from broken homes.

EMOTIONS AND BODY REACTIONS

Later we shall describe more fully how our behavior is governed by various degrees of success and failure in satisfying our wants and urges. At this point it is necessary to explain that feelings and emotions permeate the body and cause chemical reactions in it, and that change in body chemistry also creates feelings and emotions. Emotions are psychological and physiological. The body, with its nervous system, its glands, its organs like the stomach and the heart, and its blood, solutions, and chemicals, is involved emotionally.

For example, you go to an exciting football game, and you become tense with excitement. You are knotted up with anxiety. You worry about whether or not the touchdown will be made. You shout with joy, you become angry at the referee, you laugh at the opponent's

awkwardness, and you are glad when the game is over. Then a little later, when you sit down to your meal, you sense that you are tired.

There is a reason for this. Your emotions at the game were accompanied by a faster heartbeat; you breathed faster; you perspired a little more; the glands within your body gave off more juices; chemical changes occurred in your organs and blood according to your various emotions. Much energy, emotional and physical, has been expended, and consequently you feel fatigued. Maybe you are hungry, or maybe not.

You may have had the experience of being on your way to a meal in a perfectly happy frame of mind but before you reached the table you became involved in a quarrel or received sad news. Then when you began to eat, you found that you had no appetite. A chemical reaction took place in your body in connection with your anger or sadness that destroyed your normal appetite.

An old experiment that demonstrates the bodily effects or accompaniments of emotions involves a cat which was digesting a meal normally when a dog was brought into its presence. The cat became afraid or angry (probably angry), and the digestive process stopped because of the emotion. It is actually true that fear, anger, bitterness, or any unpleasant feeling upsets the digestion, while genial conversation, pleasing music, or good news improves digestion. In these facts we have more evidence of how emotions are in and of the body.

The Endocrine Glands and the Emotions. Located in various places in the body are little glands, known as *endocrine* or *ductless glands*, that secrete various chemicals directly into the blood. These glands are placed in the head, neck, and torso, but not in the arms and legs. Figure 10 gives the location of various endocrine glands.

The endocrine glands influence the emotions, and the emotions influence the activity of the glands. These glands influence growth, control strength and energy, affect the assimilation of food, and have much to do with the health. Even though the endocrine glands are only in part "emotional glands," or "glands of personality," so to speak, they are mentioned here because of their psychological and educational significance. It is important for the teacher to know about them because they are related to the growth, health, and intelligence of children as well as to their emotions and personality.

The Adrenal Glands. Just above each kidney is a small yellowish gland called the *adrenal gland*. The adrenal glands give off a hormone or chemical called *adrenin*. This is a powerful chemical which stimulates the release of blood sugar from the liver to provide more energy. The adrenals are really "emotional glands."

Let us suppose that a boy is to be in a football game. He is keyed up and very determined to win. He does not lose his temper, let us say, but in the game he is very aggressive. His feelings and emotions

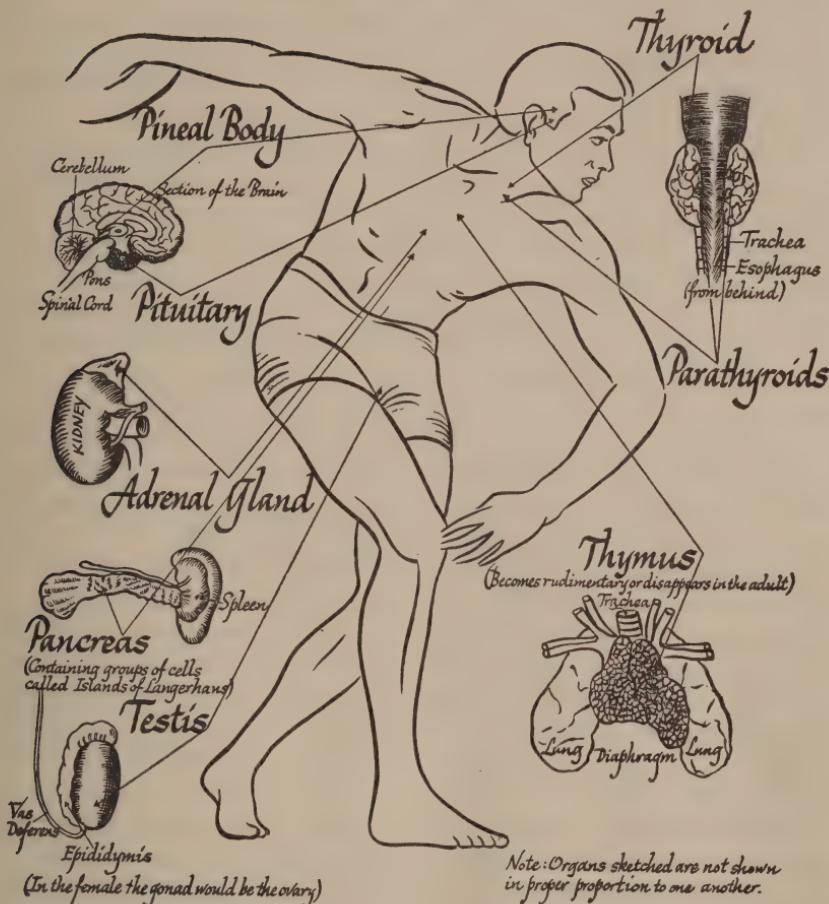


FIG. 10. The endocrine glands. (Drawings of glands adapted from Millard and King, *Human Anatomy and Physiology*, published by W. B. Saunders Company, Philadelphia; and Jung, Benjamin, and Earle, *Anatomy and Physiology*, published by F. A. Davis Company, Philadelphia.)

cause impulses to pass over the nervous system that stimulate the adrenals to give off the chemical adrenin into the blood, which in turn stimulates the liver, which releases sugar to provide the body with energy. The adrenin also stimulates the heart, which pumps faster and thus furnishes more blood to all parts of the body. Thus our foot-

ball player gets more energy and plays for "all there is in him," as the saying goes.

In the facts about the emotions and the adrenals we have the explanation of why at times people seem to have superhuman strength and power. For example, a person turns a corner and unexpectedly comes upon someone who tries to hold him up. He may strike out at his assailant and hit him a blow harder than he ever thought possible, or he may turn and run faster than he has ever run before.

What gave him such power? The emotions set off the power. First came the shock of surprise; then anger or fear caused messages to be sent over part of the nervous system to the adrenals, which released much adrenin into the blood, which in turn caused the liver to release sugar into the blood. It is this quick supply of extra energy that enables a person to have more than usual force for an emergency situation.

In fact, one of the theories about the function of the emotions is based on the idea that they seem to provide extra energy for self-preservation. For example, in more primitive times, man escaped from threatened death at the hand of fellow man or from the tooth and claw of animals by running, climbing, swinging on a vine, or striking with a club. Excitement or the emotion of fear or anger gave extra strength or power to escape from or ward off pugnacious man or animal. During the high emotional state a slight perspiration on the palm of the hands enabled primitive man to get a firmer hold of club, stone, or branch.

This theory is based on the fact that emotions operate to increase the energy supply of the body. It is called the *emergency theory* of the emotions. The validity of this theory has been questioned, but still it is known that the emotions and adrenals work together and produce various physiological and psychological reactions and that the chemical involved is adrenin.

The Sex Glands. The sex organs and glands are located at and above the crotch (see Fig. 10). In these glands we have at least the physiological structure or basis of one of the fundamental urges in both human beings and animals. The desire and urge for pleasant sexual sensations are universal. They consummate in sexual experience and reproduction. The sex drive, urge, or pressure is caused by the chemicals that the sex glands hold and secrete. The psychology of the sex drive has been elaborated by Freud, who studied the psychological effects of the failure to satisfy that urge or of the unfulfillment of sex desire. We speak of this as a *frustration*. It is explained by psychologists that frustration in this sense means that sex urges do not have normal outlets. Continued repression of the sex drive causes a redirection of behavior both

good and bad and may produce unwholesome attitudes and unhappy personalities. We are only in the beginning of the first chapter in our study of sex, but we know that the sex drives and pressures are tremendous physiological and psychological forces that influence the emotions and behavior extensively.

The male sex glands are the testes and the female sex glands are the ovaries, and these are only a part of the sexual system of males and females. Their secretions are both carried directly into the blood (ductless) and also carried into ducts. The sex glands are of great importance to the growth of the body and the development of personality. The secretions of the male and female sex glands influence the growth and development of the characteristics that differentiate the male from the female. If, for instance, the sex glands are removed from the young male, thus eliminating the effect of their hormone, he tends to become fat and to develop the more rounded body of the female rather than the typical male body. A masculine voice fails to develop, and little or no hair grows on the body and face. A girl, on the other hand, if deprived of the internal secretions of her sex glands because of atrophy or operation, tends to develop the masculine type of body. Hair appears on the face, and the voice becomes deeper, like a male voice. These characteristics involving voice, shape of the body, and the growth and distribution of hair on the face and body are designated as *secondary sex characteristics*.

Far more than almost anyone imagines the sex glands are responsible for pressures and interests causing emotional states that control human behavior. The effect of the sex glands on emotions, personality, and behavior becomes especially significant when puberty is reached. The interest of adolescent boys and girls in each other raises many problems of adjustment. The sex drive, or instinct, is one of the most dominant of human forces. The core of interest in most motion pictures and novels, in many games and activities, and, above all, in people lies in emotional elements that have a definite physiological basis.

The Thyroid Glands. Have you noticed a person whose neck is enlarged in front? This enlargement is probably caused by a defective thyroid and is referred to as a *goiter*. You probably have also seen a person who has very prominent eyes that protrude much more than is normal. This also may be caused by a defective thyroid. Such a person is likely to have a very rapid heartbeat and to be high-strung and "jumpy." He may eat a great deal and still be thin, for an excessive amount of thyroid secretion in the blood accelerates the burning up of the food that is eaten. This person has a goiter, too. Goiter is caused

by defective thyroid. In some cases the thyroid secretes too little and in others too much. In each instance, goiter develops, but the symptoms are different.

The thyroid is located below the pharynx, or in the lower front of the neck. It secretes a chemical or hormone known as *thyroxine* into the circulating blood. Thyroxine contains 65 per cent iodine. It is because of the need for iodine that goiter tends to develop in regions where there is a deficiency of this element in the water and soil and consequently in the food produced.

The thyroid has a relationship with intelligence and personality. If a child, for example, is born with a defective thyroid, one that does not secrete enough thyroid, he will not develop normally but will be deficient both mentally and physically. A child born with a thyroid that secretes too little is called a *cretin*. Mentally he may be an imbecile or idiot. Physically the head and body grow proportionately large and bulky, and the legs are proportionately small and underdeveloped. If cretinism is diagnosed in infancy and the cretin given a thyroid extract, almost normal development will take place. The dullness will drop from the face, physical development will be about normal, and the intelligence may approach normal, also. The improvement of the cretin by correcting thyroid deficiency is one of the most dramatic illustrations of how the secretion of an endocrine gland affects the growth and development of personality, intelligence, and physique.

When the thyroid gland does not secrete enough thyroxine to maintain the proper chemical balance of the body in so far as thyroxine is a factor, the resulting condition is called *hypothyroidism*. The prefix *hypo* indicates "of less quantity" or "of a low degree." The cretin we have described is hypothyroid. The person whose thyroid is underactive tends to put on weight because the food is not used up for energy. The hypothyroid tends to be less animated and more unresponsive. He probably becomes duller intellectually, also, and is not so alert and interested as formerly.

The *hyperthyroid* person has an overactive thyroid that secretes too much thyroxine into the blood. The hyperthyroid type may be described as a person who tends to have a rapid heartbeat, who is thin because excessive thyroxine causes the food to be burned up, and who is nervous and easily upset emotionally. Again we see how an endocrine gland's secretion affects emotions, the personality, and mental hygiene.

The thyroid produces various emotional conditions or predispositions to emotional conditions, and it is likely that the emotions influence the thyroid. We know that emotions and stimulation influence the adrenals

and sex glands, and it is probable that the same is true of the thyroid. Excitement, continued stress and strain, grief, fear, and worry probably stimulate it. People who tend to be hyperthyroid are urged to rest, to cultivate quiet and friendly relationships, and to avoid turmoil and difficulty.

The teacher should be on the lookout for thyroid trouble in her pupils, especially those of the high-school or teen age. If a pupil is lackadaisical, seems unresponsive, and appears dreamy, it is possible that he is suffering from iodine deficiency. On the other hand, if the teen-ager is high-strung and very sensitive and seems to be burning up his energy, he may be hyperthyroid. A teacher must not try to diagnose, of course. She should consult the school nurse. A medical examination will probably be recommended for some cases.

Near the thyroid are the parathyroid glands. They give off a chemical that stabilizes the body by keeping it on an even keel, or "settled," so to speak. If the parathyroids are injured or removed, the chemical balance of the body is so upset that convulsions and spasms will set in and death will follow.

Islands of Langerhans. The part of the pancreas that produces the internal secretion known as *insulin* is called the *islands of Langerhans*. The secreted insulin is essential for health because it controls metabolism, or assimilation of the blood sugar. A serious deficiency of blood sugar produces the disease diabetes. If this condition is not treated by administering insulin, death results.

The islands of Langerhans may not have the cause-and-effect relationship to stimulation, emotions, and personality of the adrenals, sex glands, and thyroid. Nevertheless a disease of the islands of Langerhans causes illness, and a person when ill is different in emotions and personality from what he was when well or what he will be again when cured. That the condition of the islands of Langerhans affects mental hygiene is believed, but we do not know precisely how emotional experiences or failure to satisfy our fundamental wants influences the islands of Langerhans.

The Pituitary, Pineal, and Thymus. The pituitary gland should perhaps have been discussed first, because of its great importance. In a sense it is a governing gland, for its secretion influences the growth and development of the other glands and tends to keep them in balance and maintain a chemical equilibrium for the body. The pituitary has been described as the master ductless gland.

Just what are its cause-and-effect relationships with emotions, human wants, and behavior in the sense of the quick response to stimulation

that characterizes the adrenals and sex glands is not known. Nor is it known whether there is a close relationship or whether fundamental urges or wants involve the pituitary as they do the sex glands. But the pituitary is exceedingly important for human behavior because of its importance to health and most particularly to human growth and development. Without the healthy functioning of the pituitary, normal growth will not take place.

This fact can best be illustrated by directing the reader's attention to the giants—those human mountains, as they are called by circus side-show barkers—who grow as tall as $8\frac{1}{2}$ feet, and at the other extreme the Tom Thumbs, who are as short as preschool children. Such extremes in growth are probably caused by defective pituitaries. In the case of the giants an excess of the secretion is given off. In the case of the Tom Thumbs and Minnie Mites the pituitary is deficient in its secretion. Thus the pituitary of a giant is hyperactive; that of a midget, hypoactive. Between these extremes the pituitary influences growth in varying degrees and indirectly, therefore, personality and human behavior.

The thymus gland is located in the upper part of the chest region and below the thyroid when the body is in the standing position. It diminishes in size and becomes atrophied during adolescence. Even though little is known about the thymus, it is thought that it is related to growth and sexual development and that when maturity is reached the thymus, having served its purpose, is thus discarded.

The pineal is a small endocrine gland located in the middle of the brain. Its purpose is not clearly understood, but it is believed that it, too, gives off a secretion that influences body growth and sexual development.

THE ENDOCRINE GLANDS, MENTAL HYGIENE, AND HUMAN BEHAVIOR

Much nonsense has been written about the glands—how years can be added to life by grafting young glands into the body and how by taking extracts that are like the secretions of the endocrine glands a vibrant, winning personality and better health can be achieved. Health and personality cannot be obtained thus. However, there is no question about the relation of the glands to health, personality, growth, the emotions, and human behavior. The endocrine system secretes the chemicals that if in balance contribute to our health, emotional stability, and personal happiness.

The secretions of the pituitary, pineal, thyroid, and sex glands control physical growth and development and thus, indirectly at least,

affect personality and behavior. The thyroid, adrenals, and islands of Langerhans control metabolism (how the body uses the food that is eaten) and thus influence our well-being. The functioning of the adrenals and sex glands and, particularly, the thyroid produces various emotional states, and in turn the emotional states influence the functioning of these glands. In the future, science may learn much more about how the endocrine glands affect mental health. Possibly, through the treatment of the endocrine glands and the control of the chemistry of the body, many difficulties of emotions and behavior will be corrected.

If in the future we learn more and more about the endocrine glands as well as the nervous system, the various organs, the blood and the muscles, and their cause-and-effect relationships with human emotions and behavior, along with this knowledge we shall learn how to improve learning, control the emotions, govern behavior, and in general develop personality and achieve much better mental health and happiness than we have now.

At present we do know that there are fundamental relationships between the physiological functioning of the body and the emotions and mental hygiene and that mental hygiene has a tremendous effect on how the body works and on its health. The feelings and emotions are not just the transitory and superficial experiences that they may appear when a person jumps with surprise, smiles, drops a tear in sorrow, or shows a worried face. On the contrary, they are truly deep-seated, having their physical counterpart in physiological reactions. In these body reactions we may have the explanation of why feelings, emotions, and their related attitudes influence behavior as they do and why people are emotional beings to probably a greater degree than rational ones. Feelings and emotions, with their physiological accompaniments, govern our behavior much more than do rules and regulations.

In this connection, the teacher can be a good psychologist by making use of the emotions to develop health and happiness in her pupils as well as in herself. Furthermore, by developing healthy emotions in her pupils, she can control their behavior much more easily. With good will and good feeling the teacher works "with the grain." If she has not developed happy emotions in her pupils, she will have to work "against the grain." The teacher does more than cover a course of study more or less effectively. She produces shyness or confidence, fear or courage, pain or pleasure, unhappiness or happiness, and shame or pride. There are physical correlates of these feelings or emotions, all of which influence greatly the developing of personalities, which consequently will be healthy and wholesome in varying degrees.

The teacher can develop the personalities and mental hygiene of her pupils by helping them to achieve their wants and satisfy their needs. She can teach and guide them so that they achieve a feeling of worth and wholesome pride, a happier adjustment with the opposite sex, social and economic security and greater security of life, pleasant experiences and freedom from pain, and wholesome activity and freedom to grow and develop.

SUMMARY AND REVIEW

The basic human wants, drives, and urges that motivate most human behavior are those for life and economic and social security; personal worth; pleasure, satisfaction, and the avoidance of pain; stimulation and activity; individualism and freedom; and the satisfaction of the sex urge. The teacher, in guiding the learning and personal development of his pupils, must make an optimum adjustment to these drives in order to obtain maximum growth and development.

When the basic wants and drives are not satisfied, emotional difficulties arise and maladjustment results. Consequently, in the case of students who do not respond wholesomely to a situation the teacher should look for failures to satisfy basic wants. The problem then is to make changes that will result in satisfaction.

The endocrine glands are involved in emotional responses and behavior and also in growth and development. These glands are the adrenal, sex, thyroid, and parathyroid glands, the islands of Langerhans, and the pituitary, pineal, and thymus glands. They are more or less involved in human drives and wants and in the emotional adjustment of the individual. Growth and development are also dependent on the endocrine glands.

Test Your Thinking

1. In today's schools, much emphasis is placed on health and safety education. Discuss what fundamental wants and motives this emphasis is based on.
2. Show how students are motivated to go to school by the drive for economic security.
3. Students have their gangs, cliques, fraternities, and sororities. What drives and urges underlie such organizations?
4. In school, students compete to be on the honor roll, to be on athletic teams, to gain the approval of their classmates and teachers, and to be class leaders. From what fundamental want or wants do such activities derive?
5. In the old school, physical pain was inflicted frequently in order to stimulate learning and control the pupils. This is rarely done in the modern school. In view of our strong tendency to avoid discomfort and pain, do you think the old school used an effective method?

6. The modern school uses the project and activity method in the classroom and in addition has a rich program of extracurricular activities. Discuss whether or not you think such activities are fundamentally sound in terms of human wants and urges.

7. There is an increased demand for sex education in the high school. Discuss whether or not you think such education is psychologically sound.

8. Describe a person whom you think very thwarted and frustrated.

9. Describe a person who is well adjusted because enough of his wants and fundamental motives are well satisfied.

10. The emotions have their roots in the organs and glands. Explain.

11. Show how the organs and glands affect personality and health.

CHAPTER V

EMOTIONS, PERSONALITY, AND MENTAL HYGIENE

What to Look For. Learn what proportion of pupils is likely to become seriously ill mentally, and contrast the personality problems of the extreme deviates with those of the normal.

Differentiate between undesirable and desirable worry and concern. Note the principal causes of worry among pupils and students and what can be done about them.

Learn the meaning and effects of complexes, repression, rationalization, compensation, fantasy, conflict, and temper tantrums. Show how these mechanisms result from a failure to satisfy one's wants and urges.

Observe how maladjustment can result in mental and physical illness.

Describe how people differ in their resistance to the severities of life.

What are the meanings of the terms *escape* and *defense mechanisms*?

Introduction. When a teacher faces her class, she should realize that 1 out of every 20 of her pupils, or 5 out of every 100, will at some time as adults be in what is called a mental hospital. This is what will happen on the average.

The 1 out of 20 of whom we are talking will be in a hospital in this instance not because of an organic illness such as a weakness of the heart or appendicitis, cancer, or tuberculosis. In fact, a physical examination will usually show that the body seems well. This person will be in the hospital because of emotional trouble or a personality disorder. It will be said that he is in poor mental health or is mentally ill. (A rather severe term for such illness is insanity or psychosis.) It may be that such a person has had a mental breakdown, acts queerly, is emotionally depressed, is shot through with fears, does not respond normally to the people with whom he deals, or fails to meet the requirements of his position because of personality disorders.

There will also be those who will not be sufficiently maladjusted to go to a hospital but will need treatment. Including those who go to a hospital, it is estimated that 1 out of 10 persons will need the treatment of a psychiatrist or a doctor who specializes in the treatment of what is termed *mental diseases*.

There remain the 9 out of 10 who are normal and have no problems

so serious as to require psychiatric attention but who nevertheless have their unhappiness and personal problems. All of us have worries, distresses, fears, and difficulties, though fortunately they do not become so serious as to make us morbid. But we should all understand mental health and hygiene so that we can be more efficient in preventing or overcoming our difficulties. As teachers, we should be familiar with the personal problems, the troubles, and the mental hygiene of our pupils so that we can understand our pupils and help them.

In the discussion that follows, attention is centered in the emotional states or the mental health of normal people. We are not concerned here with the extreme forms of maladjustment that need psychiatric help or hospitalization. A few introductory facts about serious abnormality of the emotions and mental state were given, to sharpen the consciousness of the teacher about the problem of mental hygiene for her pupils as well as for herself. They should make us conscious of how important the satisfying of human wants is, of the significance of having healthy emotions, and in general of the responsibility of the school for developing good habits in the pupils and helping them to live successful and happy lives.

As pupils attempt to fit into their environment and try to control their environment by mastering their lessons, by getting along with their parents and teachers, by standing well with their fellows, by achieving or maintaining good health, and by any number of similar efforts, they experience their worries, upsets, disappointments, and conflicts. Some develop mechanisms of thinking and behavior that are substitutes for good ways of doing things and that consequently cause poor mental health. In the next few pages, discussion will center in various aspects of the feelings, emotions, and personality of an individual that control his mental hygiene and personal adjustment.

Worry, or Overconcern. Let us begin with an affliction common to almost everyone—one that centers principally in our want for security and our want for importance and personal worth. It is our anxiety about satisfying these wants, and others, that causes us to worry.

Specifically, what do pupils and students worry about? Worries differ for pupils of different ages. Grade-school children have outlooks and experiences different from those of college students, and consequently their worries differ. However, there is some similarity—college students, for example, are more worried about jobs than are grade-school children, but both are worried about their studies.

The following is an analysis and summary of what all pupils and students worry about:

1. They worry about being successful in their studies. Such worries and anxieties center in getting to school on time, mastering their lessons, obtaining good report cards, and failing in their studies.

In her inquiry about the problems of high-school pupils Miss Pope describes a boy who explained that one of his problems about getting along was caused by lack of ability. The boy said, "One of my problems is that I can't read good enouf to be in high school, and as you can see, I can't wright or spell vary good."

The attitude of their fellows toward them is of great importance to students. They want to be well thought of by their fellow students and to have a feeling of personal adequacy, and they do not want to lose any friends.

2. Pupils are anxious about their relationships with their teachers. This anxiety is a phase of another fundamental concern of pupils, which is about how they get along with others.

3. Personal relationships that concern pupils are those with parents, brothers, and sisters. Children want the love of their parents. Because of a craving for security, they want to feel that they are appreciated and wanted by their parents. Difficulties with their brothers and sisters, such as quarreling, trouble a considerable number of children, and they are probably more concerned about being scolded by their parents.

The concern about relationships with teachers, parents, brothers, sisters, and one's fellows centers in social adequacy. Pupils want to get along with people, they want friendship, and they dread losing a friend. When boys and girls reach the adolescent stage, they are especially concerned about their popularity with the opposite sex. Girls want to be asked for dates, and boys are anxious about having dates with the girls of their choice. Such problems merge into the problems of serious courtship and of marriage.

4. As a child gets a little older, he worries especially about economic security. He is concerned about his father's job, having a nice enough home, and having money enough to buy good clothes so that he will look as well as other children do. This concern has its roots not only in the desire for economic security but also in a feeling of personal worth and the related social security or adequacy.

Some investigations indicate that a substantial proportion of high-school pupils are not concerned about a job or vocation while other investigations show the opposite. As one boy said, "I'm very much concerned about my record in high school because I know if it's good it will help me get a good position."

5. Another source of worry and anxiety is health and a feeling of

well-being. We like to be well, to be free of illness, and to have a feeling of being healthy and strong. Children as well as adults are worried by a headache, a pain in the region of the stomach, an ache in the joints, or some physical discomfort. Some do not sleep so well as they should or are anxious about their appetite. The matter of weight is a concern to many. The high-school athlete wants to be heavier. Girls, in particular, are afraid that they are too heavy, although this is usually not justified.

Anxiety about health is not one of the worst troubles of young people, but it is an important one for some. Related to the anxiety about health is the worry about death. On that score, pupils should take solace in the fact that death is at the minimum for those of school age, the very least probability of death being at the age of ten.

Children in many instances are much concerned about the health of their mothers and fathers. It is not uncommon for children to be anxious when they see their parents suffering pain or illness. Parental illness worries children because they do not want to lose those who give them economic and social security.

The concern of children about their health stems from the basic want for security of life and the want for good and pleasant feelings and therefore the avoidance of pain. Children have the want for an active life, for almost unbounded activity and freedom, it seems, and bad health limits the fulfillment of these basic wants.

In general, the anxieties, worries, and overconcern of pupils are about their lessons and meeting the requirements of the school. This concern merges into that about future economic security and getting a job. Concern over personal and social adequacy is evidenced by worry over getting along with the teacher, with one's fellows, and with one's family. Worry over personal and social adequacy extends into many activities. A child has not lived long before he becomes conscious of the importance of economic security, and this soon becomes a concern. Almost every child while very young has the experience of illness and confinement to his bed and thus learns to be anxious about his health and well-being.

What can the teacher and school do about the worries and anxieties of children? First, the teacher can discuss the topic of worry with her pupils so that they will understand the futility of overconcern. She can point out that it is useless to worry about the past. Yesterday and what we have done yesterday are gone and cannot be brought back. One should calmly review what is past and profit from it as so much valuable experience. In order to make progress, one has to rid

oneself of the handicaps of worrying about the past. Let the sky of today be clear of yesterday's clouds.

The present can be mortgaged by a dread of tomorrow. Most of the troubles and difficulties we anticipate do not develop. When pupils fret and fume about a coming examination, they waste energy that should be used in preparation. When they take the examination, they usually find that they can pass it.

It is the present that counts, as no doubt the Good Book means when it speaks of taking each day in one's stride. One should be concerned about the future, but not to the point where he becomes so highly emotionalized that he cannot think and work effectively. When energy is dissipated in worry, it cannot be used for the work at hand. A knowledge of the general futility of worry will not prevent it entirely but may help to prevent some of it.

In addition to helping children understand why they worry and the futility of most of this, the teacher can reduce the emotional tensions of overconcern by developing in the classroom an atmosphere of calm and wholesome industry. First, the teacher should not herself indulge in worry but should be at ease and should proceed without much apparent wear and tear. A sense of humor reduces tension, and students respond favorably to a teacher whom they describe as a "good sport." Excessive rivalry, with emphasis on prizes and honors, produces excessive tension among some pupils and a feeling of "I'm not in it" on the part of many. The present emphasis on school marks, with the consequent threat of not being promoted, causes undue concern among a considerable number of pupils. For the good of the students, situations that create excessive emotional tension should be eased.

This is not to convey the notion that conditions in the classroom should be so free and easy that there will be no worry. Indifferent and oversoft education would develop unhappiness, too, and would be conducive to poor mental hygiene. Pupils should feel some anxiety, but in the sense that they should be concerned about their duties and responsibilities, or they will accomplish nothing. Worry in the sense of wholesome concern is really necessary if pupils are to come to grips with their problems. If they are truly concerned about their lessons, they are determined to master them.

The person without the ability to worry in this sense drifts along with little or no concern for anything. He is careless, indifferent, and irresponsible. It would be well for such a person to worry a little, not to the point of becoming overexcited or overconcerned, but to the point of developing a real determination. The person who has little or no

concern for anything misses the exhilaration that comes to pupils who have the experience of working hard and achieving their goals. Such success is necessary for achieving the best mental health.

Complexes. As a child, he was forced against his will to eat oysters. He hated oysters because of the way they looked, felt in the mouth, and tasted. To him they seemed slimy. Some of those he ate were gritty. He loathed them, but still his parents made him eat them. Thus he developed a complex about oysters, and whenever he saw an oyster or even heard the word an unpleasant feeling was aroused.

A complex is an emotionally toned thought, idea, or memory. This means that when a certain thought or idea comes to mind it is accompanied by feelings and emotions. Complexes can be pleasant or unpleasant, although we usually think of them as the latter.

Hates, biases, prejudices, bitterness, and jealousies are complexes and often go together. Here is a young man who hates a second young man and is jealous of him. The reason is that in competition for the good will of a young woman the second man was successful and thus put the first in an inferior position and deprived him of the pleasure of the young woman's company. The thought of the successful man, and probably of the girl too, invariably makes the first man feel angry and bitter. These ideas are emotionally toned or are saturated with feeling; hence we say that he has a complex.

Complexes can develop about almost anything. However, they usually develop around happy or unhappy experiences or those which satisfy or fail to satisfy our fundamental wants or urges.

A child who has an unhappy home or one of low socioeconomic status on the wrong side of the tracks may have unpleasant feelings about his home and its standing in the community. The child who fails in school or finds the work too hard will have ideas and thoughts about his work that are toned with unhappy emotions. Children may feel that they are not so bright as most. Others may feel themselves too tall or too short, too slim or too fat or may have big noses, buck-teeth, or some deviation of which they are sensitive. This sensitivity is caused by a complex or unhappy feeling that accompanies the idea or thought of these personal characteristics.

You have heard of and probably know some narrow people. Such persons have a few positive and negative ideas and are intolerant of the ideas of others. Much of this narrowness and intolerance is caused by a training that sets up prejudices or feelings—positive in respect to the things favored and sharply negative in respect to those opposed. Narrow people generally take a very firm stand for or against; they

do so because they have become hemmed in by complexes. It is in the area of tolerance and in the development of generous attitudes toward other people and their ideas that the teacher can accomplish much by enlarging her pupils' knowledge and understanding and by being herself tolerant, sympathetic, and broad-minded.

Another complex that should be mentioned and described is one that pertains to feelings about oneself. To each person, he himself is the most important person in the world. Each person has many thoughts and feelings about himself. For example, a pupil who is a good ball player, who gets his lessons easily, and who has many friends has a feeling of confidence when he thinks of himself. Another pupil has a feeling of confidence when he thinks of himself in terms of his school subjects but a feeling of inferiority when he thinks about his relationship with his fellows, for these are not satisfactory. There are children who have so little success that they feel inadequate or inferior in many ways.

We speak of a person whose ideas about himself are tinged with feelings of inferiority as having an inferiority complex. This means that when he thinks of performing a task, is faced with a problem, or is associated with people in a social situation, his ideas and feelings about himself are to the effect that he is inadequate or inferior and that he cannot perform work or get along with others very well. He is self-conscious and lacks confidence.

Persons with an inferiority complex are apt to be shy and sensitive and often like to be alone. They are hungry for praise and resent criticism that is unfavorable even though constructive. They are hard to get along with, for they do not know how to give and take and are what is known as "thin-skinned."

Of college students asked by Fenlason and Hertz to indicate their feelings about the adequacy of their personality, 2 out of 3, or 67 per cent, were conscious of defects in personality. A little over 1 out of 3, or 38.5 per cent, had feelings of inferiority. Only 1 out of 10, or 10 per cent, felt no particular handicaps of personality. Data like these show how much people really live with themselves, so to speak, and how important feelings of self really are. We cannot slough off personality. It is always with us, and we continuously face the problem of getting along with people and of being happy.

The problems of personality center largely in the self and the want of the individual for having others think well of him and for self-esteem. College students felt that their problems were shyness, self-consciousness, overmodesty, few friends, aloofness, awkwardness and backwardness, the fear of being made a fool of, and the fear of the opinions

of others. Practically all their thoughts and feelings center in personal and social adequacy and the resultant feelings of inferiority. They give as the cause for the development of feelings of inadequacy certain lacks or deficiencies, such as lack of opportunity to meet people socially, lack of money and proper clothing, and lack of experience in social situations.

It appears from this that the college students are putting the blame where it does not belong. They are projecting the blame outside of themselves on conditions over which to a great extent they have control. As human beings we should further our own adjustment appreciably if we blamed ourselves rather than projecting the blame elsewhere. One always has a chance to meet others; in fact, one is always with other people, and one's success with them depends on one's ability to get along with them. This is almost entirely the individual's responsibility. Experience in social situations is gained by seeking out people, being friendly, and making friends. This, too, is largely the individual's responsibility.

Clothes and money are important, but it is altogether too easy to blame one's lack of these advantages for one's social inadequacy. It is one's own worth that really counts: if one will develop personal charm and friendliness, most of the other problems will be incidental. The surest and quickest way to make an adjustment and dispel feelings of insecurity and insufficiency is to put the blame sternly on oneself and then try to improve.

A teacher should be on the alert to discover the complexes of her pupils. If a pupil has an inferiority complex, the first question to ask is why he has ideas and feelings of inferiority. Perhaps he is failing in his work and has no friends; the problem then is to give him more success, praise for sincere efforts, special recognition for achievement, and guidance socially so that he will have more friends. It is not easy to overcome complexes, but sympathy and understanding will help. If the teacher expresses faith in her pupils, recognizes their strong points, and helps them succeed, she will do much to develop in them healthy attitudes toward themselves and their work.

One may also have a superiority complex. The person with a superiority complex has much confidence in himself. His feelings about self are pleasant and satisfying because of the feeling of superiority.

What appears to be a feeling of superiority may be a cover for a true feeling of inferiority. In order to understand a child, the genuine feeling of superiority must be distinguished from the pseudo feeling. Some persons with feelings of inferiority appear confident, "bossy,"

and superior, and try to give the impression of being important, but they are merely trying to make up, consciously or unconsciously, for true feelings of inadequacy.

Complexes prevent clear thinking, for emotions and feelings obstruct ideas or guide them illogically. We all know that we cannot depend on the opinion of a prejudiced person, for he will not take the facts into account but will be governed by envy, hate, or friendship. Furthermore, a person affected by feelings and emotions becomes confused or has stage fright, and his answers are slower, less clear, and less likely to be right.

Repression. Our complexes trouble us. Therefore we try to keep them secret and eliminate them from our consciousness. We attempt to repress them because we want to guard against exposing some experience or idea about ourselves that may reflect on us unfavorably. We always stand guard to protect our ego or feeling of personal worth.

In schoolrooms which are too formal and in which there is little activity and freedom of expression, pupils are likely to repress their feelings. In other words, in an atmosphere of suppression there will be more repression.

There are many experiences a person tries to repress—failure in a subject, trouble in the home, a quarrel with a classmate, or rejection in love. All these experiences and many like them tend to lower the prestige, and the logical thing is to relegate the idea, feeling, and all to the subconscious in order to hide them from view.

Repression is a process of storing away trouble for the future, for it is impossible to bottle up one's complexes without their causing unhappy emotions and undesirable behavior. Let us illustrate with the case of a boy of high-school age who has been unsuccessful in gaining the friendship of the girl in whom he is interested. He pretends to be indifferent and represses as a secret the fact that she has refused his attentions. He tries in word and action to convey the idea that he no longer cares for the girl, but in doing this he is stirring up all the pain connected with the unhappy experience. His manner is evasive and defensive whenever the matter is mentioned; in short, he is not telling the truth either in word or in action. The net result is that he is not living very effectively. Whenever an association with his unsuccessful romance is made, the original complex is set off, he again feels unhappy, and his behavior is distorted.

Repressed complexes are like so many slivers in the body. Whenever a sliver is touched there is pain. Therefore activity is governed so that no sliver or sore spot will be touched, and this restriction or redirection of activity results in the behavior of avoidance.

Now the one thing to do with slivers is to pull them out and disinfect the wounds in the flesh. The same should be done with the complex. It should be extracted from the subconscious and brought into the open and then the emotional balance restored by facing the unhappy situation fully and frankly.

The way to remove a complex is to talk it over with someone who is trustworthy and in whom full confidence is reposed. Recognize frankly the truth of the situation. Just as it is painful to pull out a sliver, so it is painful to discuss truthfully an unhappy experience. There are occasions when in order to save one's ego value and prestige one must acknowledge the experience that seems to reduce that ego. In time, however, ego value is usually restored.

Personality may be distorted, with consequent maladjustment, because of the repression of unhappy experiences that may have occurred many years before. One of the fundamental principles of psychiatry is to cause the patient to speak freely and try to recall unhappy experiences, even childhood experiences, that may have wounded the personality and may still be affecting it. It is conceivable that a situation in which parents were too busy to pay attention to a child and thus seemed to reject him, or a failure in school, or a poor family background may have resulted in repressed complexes. If a psychiatrist can bring them into the open, improvement in the personality can be achieved.

Complexes develop from wrongdoing and unhappy experiences. One can save oneself from some of these by clean living and being a good citizen. However, there are circumstances in life—unavoidable failure in schoolwork, relatives who are scoundrels, having few friends—that will almost inescapably cause complexes and consequent repression. In dealing with the complexes produced by unhappy circumstances in the schoolroom, it should be remembered that a teacher who gains the confidence and good will of her pupils will be talked with by them. Her pupils may unburden themselves, as we say, and rid themselves of their repressed complexes. One of the values in a good guidance and counseling program is that teachers and students have a chance to talk with each other. In talking about a pupil's problems the pupil is encouraged to bring his complexes out in the open, analyze them, and dispose of them. A teacher in order to be effective must be liked by her pupils and have their confidence.

Rationalization. A high-school girl hoped to be asked by a certain boy to go to a party with him. But he asked another girl. Our young woman said, "I wouldn't go with him if he was the last boy on earth. He isn't at all interesting, and I could never like him the least bit."

What she said was not true, and yet it may have sounded convincing. She was trying to maintain her prestige with the other girls, and her ego value. Her attitude is sometimes described as trying "to save face."

This girl was rationalizing. She gave an untrue explanation but one that might appear reasonable and convincing. Rationalizing is the process of protecting our feeling of worth or self-esteem, the process of "saving face" by giving feasible but untrue excuses.

In this instance the rationalization took the form known as "sour grapes." The term comes from Aesop's fable about the fox who when he could not secure the grapes he wanted called them sour and implied he did not want them. When our high-school girl did not receive the invitation she wanted from the boy she was attracted to, she said that he was uninteresting and that she could never like him.

It is not uncommon for pupils to say that good school marks are unimportant because the persons who are most successful in life and make the most money were poor students in school. It is also often claimed that the "grade getters," the students who get the good marks, are usually teachers' pets and frequently fail on the job. Statements like these are considerably more false than true, but they offer satisfaction to the students who do not do very well. This sour-grapes rationalization saves their sense of importance and gives them a feeling of worth.

One pupil says to another, "I'd learn that stuff in algebra if the teacher could only explain it. I don't believe she knows it herself." Now it is quite possible for such a statement to be true, but we shall assume that in this case the fault is the student's and that he is projecting the blame on the teacher. Putting the blame on someone else in order to excuse oneself and protect one's own standing is a form of rationalization known as *projection*. We lay the fault on someone else in order to maintain our own ego.

A truant says that the reason he does not go to school is that his clothes are not good enough. The fact is that he can have good enough clothes if he wants to, but he projects the blame on the lack of clothes. He is rationalizing. In this instance, he is only partly defending his feeling of worth. He is principally interested in staying out of school because he is happier and more satisfied out of school than in.

"We lost the baseball game because it was so wet our pitcher couldn't handle the ball." The ball was wet for the other pitcher, too. This is projection, putting the blame on the slippery ball. The player will not admit that his team was beaten because it did not play so well as the other team.

"Oh, it will come out all right," says a pupil who is getting poor marks on his lessons. "It will turn out for the best. I'll pass anyway." Similarly, a boy who is not promoted says that this is probably all for the best, for now he can cover the ground more thoroughly. In both instances the boys are careless and indifferent. Their failures are entirely their own fault, but they are trying to satisfy themselves by saying it is all for the best. This form of rationalization is called "Pollyanna" or "sweet lemon." The first term is derived from the book whose heroine Pollyanna regards everything from an ultraoptimistic point of view. The second term is used because a sweet response is made to a bitter or sour situation. The football coach who loses all his games, speaks in lachrymose tones about the spiritual and character values of football, and says that learning to lose is more important than winning and that a disastrous football season is really the best one the boys have ever had is rationalizing in Pollyanna or sweet-lemon form.

Rationalizing is bad if the failures are the result of indifference and lack of effort. The Pollyanna attitude is then just a cover for weak character. Thinking of misfortune or failure as a blessing in disguise is helpful to mental health if one has done his best and will continue to do so. A Pollyanna attitude may be wholesome when nothing more can be done, as in the case of death or unavoidable failure. But it is unwholesome when it is merely a glossing over of avoidable failure.

Rationalizing is a common defense mechanism. People of all ages rationalize in order not to be reduced in the opinion of others and to keep a feeling of worth. In this connection, teachers and pupils at a suitable time can discuss the value of facing reality, of being realistic and telling the truth. It should be pointed out that rationalizing deceives no one, not even the rationalizer. It should be shown that there is no substitute for honesty, straightforwardness, and meeting a problem face to face instead of exculpating oneself and trying to deceive others by false though apparently logical and sound excuses. Rationalizing is counterfeit; like counterfeit coin, it does not ring true, nor does it meet the requirements of exchange—the successful exchange of human relationships.

Compensation. Everyone loves favorable attention. It is a form of recognition that everyone likes. We like to be noticed.

When a person joins a group and a little later says to one of the group, "I didn't think you noticed me," we have an example of dislike at not being recognized.

Almost everyone, if not everyone, aspires to good standing in the eyes of his fellows. Pupils want to be popular; everyone likes to be known as being bright; boys particularly are proud if they are strong;

a reputation for courage and nerve is accompanied by a feeling of pride. Conversely, a boy hates to be called a sissy; no girl wants to be homely; no pupil wants to fail in school; and no one wants to be without friends. We abhor feelings of inferiority, strive for acceptance by the group, and enjoy the accompanying feelings of worth.

If a pupil cannot master his lessons, fails of promotion, and becomes retarded, he is soon recognized as a weak student by his fellow students. Such a retarded student will do something to gain the respect of his fellows. Perhaps he will attempt this through boasting, loud talk, and swagger. Probably he will turn to mischief and cause the teacher trouble. He may get some satisfaction from the notice he attracts when the teacher is obliged to halt classroom procedure in order to quell his mischievousness. At least he has some importance when the teacher has to accord him special attention and when the boys begin to talk of him as not being scared of the teacher. When a boy is referred to by his schoolmates as a fellow who is so smart the teacher can't catch him or who isn't worried about anybody, he begins to feel superior. Through troublemaking, he is compensating for failure to gain recognition by doing his duties as a pupil.

The bully is probably compensating for some inadequacy. He may feel inadequate because of his home background, his family being poor, or because he is not doing well in school, or because he feels he is not liked by his fellows and thus lacks a sense of "belongingness." Consequently he may lord it over others and bully them. He acquires thus a feeling of worth and superiority. His bullying is compensation for his inadequacies and the feeling of being less important than he wants to feel.

Some persons have an air of aloofness and of being better than others. They are commonly referred to as being "stuck-up." Such boys and girls and adults, too, are probably compensating for an inferiority complex. In fact, most compensation is an attempt to cover or offset a feeling of being inferior. Through being aloof a person attempts to give the impression of being superior. When you see one who seems haughty, proud, or snobbish, you can be almost sure that these attitudes of his are compensatory efforts at trying to appear better than others.

Usually, the truly successful person who is really superior puts on no airs whatever. Usually he is just a good fellow who is easy to talk to and rarely says much about himself. The successful man is usually interested in the other person and shows it by asking questions about him and showing interest, friendliness, and concern about his general welfare.

Another form of compensation shows itself in attitudes of "cockiness" and pugnaciousness. Here is a little fellow who has an affected walk and general demeanor that suggest a strutting cock. He apparently wants to give the impression of being snappy and alert. He is quick to sense unfavorable criticism and quick to defend himself against it. Although he does not realize it, he is really "putting on an act." He is compensating for a feeling of insecurity caused by his small size.

In this connection it is well to look for feelings of insecurity and inadequacy in people who deviate considerably both mentally and physically from the average. Very large or very small, very fat or very thin, and very short or very tall persons tend to be conscious of being different and may make up for this in many ways. They may show shyness, and retreat from the group. This is not compensation, however, but a withdrawing in an attempt to minimize the discomfort of being unfavorably different.

There exists a good form of compensation that should be explained. This is not the "false-front" type of compensation, which we have discussed in some detail, but a real and useful kind of behavior that helps overcome insecurity and inferiority. Here, for example, is a pupil who is not a good athlete but has good learning abilities. He devotes himself to his lessons so that he can maintain a good scholastic record. He is thus compensating for an inadequacy in athletics by being an exceptionally good student and getting his worth thereby. Doing well academically will help him make a good adjustment.

In this form of compensation you monopolize and exploit your best qualities, so to speak, in order to minimize the importance of your poorest qualities. We do in life what we do in bridge—play our strong suits and slough off the weak ones.

A girl, for example, may deviate considerably from prettiness. As the world is now constituted and probably always will be, not being pretty is a disadvantage. But the disadvantage can be overcome. Of course, every person should look as attractive as possible. But in our example the girl can compensate by being pleasing, developing a charming personality, and making situations attractive and comfortable. She can learn to excel in many things such as sewing, cooking, dancing, and many sports and activities. All this represents good compensation.

A person should not compensate for a weakness that can be overcome or cured. Attention should be directed to overcoming a weakness. One of the greatest track stars of all time was weak physically and had an injured leg. He trained and trained until he gained the great

satisfaction of being an outstanding champion. Others have felt the handicap of a poor education and so have set about acquiring a good one while others were complaining that they never had a chance to go to school. Others who could not get along with people studied wherein their failure lay and set about correcting their personal weaknesses and developing favorable personalities. A teacher should try to show her pupils how to overcome their weaknesses. If a child is not up to par physically, she should enlist the help of the school nurse and the teacher of health and physical education. If a child has speech defects, she should correct them. If a child is a poor student, she should help him to learn how to study effectively so that he can be a better student.

Let us turn our attention to the teacher and her personality and methods of teaching. The way she teaches and her attitude toward her pupils show the degree of her knowledge of the subject matter and the amount of ease and friendliness in her relations with her pupils.

All of us know the authoritative teacher who does not like to be asked questions, who discourages discussion, and who requires definite, unqualified answers. There is little range of subject matter, and procedures are mechanical and held in a narrow groove by closely following the textbook. Such a teacher keeps strict control over questions and answers. She interprets curiosity on the part of the pupils as a testing of her knowledge and at once is on the defensive. This teacher does not know her subject matter well. Her authoritarian method defends her weakness and is a compensation for it.

This teacher is not sure of herself. Consciously or unconsciously she becomes arbitrary and authoritative in order to gain a control over the situation that she would not have in an atmosphere where curiosity and inquiry are encouraged. By her more dictatorial methods she acquires a feeling of ascendancy and superiority by placing herself over her pupils and subordinating them to her. Many teachers gain much satisfaction by placing themselves in a position of arbitrary authority where they dramatize themselves and acquire a feeling of worth. Possibly this is good for the teachers, although it is certain that it is not good for the pupils. A teacher should get her satisfaction from true worth, not by compensating for her weaknesses, which in any case seldom yields true satisfaction.

The teacher who has a thorough understanding of the subject and good personal qualities in dealing with her pupils is free of the complex of inadequacy. She has confidence in herself and consequently gives the pupils more liberty of thought and action, for she does not have to operate behind defense methods. She can act as a friend and helper

of the pupils and can work cooperatively with them on projects. If unforeseen difficulties arise or if problems develop to which teacher and pupils do not know the answers, they can set about as investigators to find the answers, which is as it should be. The good teacher helps pupils develop experimental situations. She likes to see new problems come to the front, for she is a guide and learner working with her pupils, rather than a question-and-answer teacher who keeps the lesson on the narrow plane where she knows the answers. The teacher's methods reflect to a considerable extent her scholarship and personality.

Dreaming a Better World, Daydreaming—Fantasy. When Miss Jones called on Rollie, he was startled, seemed confused, groped a bit, and then asked to have the question repeated. You may ask what Rollie had been doing. He had been in another world, a world of his own making, a dream world. Rollie had been daydreaming, had been in the land of fantasy.

When the real world is so difficult and severe that we are discouraged by defeat and are unhappy, we escape by dreaming about what we want for ourselves and try to satisfy ourselves by fanciful imagination. We try to get for ourselves what we do not have in reality. The weak and tired fancy themselves strong and manly, the poor dream for riches, and the person who enjoys little success has himself adored in his fantasies because of his great triumphs. In the dream world a person overcomes his weaknesses and turns an unfriendly environment into one that is most satisfying.

Many stories and tales are imaginative in nature and afford the reader an escape into glorious and happy situations. Motion pictures encourage people to identify themselves with the hero and heroine, and thus experience loveliness, romance, wealth, distinction, and conquest. A little pleasant escape may not be harmful, but habitual retreat from reality is bad. Much time is wasted thus, and when the person who has expanded his ego in fantasy gets back to the real world he is less competent to face reality than ever before because he is farther from it.

The teacher should try to identify her daydreamers, those pupils who are "absent though present." She should look for the most serious aspects of daydreaming—the conditions that cause daydreaming. What failures and disappointments does the daydreaming child experience, and why is he failing to get a sense of worth in reality? A careful study should be made of the child and special effort exerted to arouse his interest. The child who dreams may be of any capacity, but there is a likelihood that he finds the work too hard or too easy. In other words, the pupil is probably dull or bright, though not necessarily so. If he is

kept busy and experiences success and the approval of the teacher and his classmates, he will probably be cured of daydreaming.

The following is a description of a girl who escaped into dreamland and lost herself, as all do who try to dream away their problems: June was only two years old when her mother died. Her father, who was a poor carpenter, could not afford a housekeeper and had to rely on his five older children to bring her up. She was tolerated but not given the affection she craved from her family and formed a shell about herself, shutting even her school friends out. Having no responsibility, she became lazy and dreamy and perfectly contented with her solitude. Life was colorless and uneventful. One by one her brothers and sisters left home, leaving her the responsibility of keeping house for her father. By this time her habits were so formed that she did not adapt herself to her new situation. She went about as she pleased, going to motion pictures in the evenings and sleeping half the day when she was not in school. In the summer she spent most of her time swimming in a nearby lake or just basking in the sun on the lake shore, dreaming or reading magazines. People said she was queer but felt sorry for her because she had no mother. She was always excused because she was "just Junie."

When a girl named Mabel moved into June's neighborhood, they soon became good friends. June was then thirteen, a tall, "gangly," homely girl, very soft-spoken and dreamy-eyed, and capable of telling the most fantastic tales. June invited Mabel to join her at the lake, and in the evening they would lie on the shady shore and June would verbally paint the most enchanting pictures. She confided in Mabel her one great dream—she would be Queen of Rumania. She had fallen madly in love with Prince Michael. She brought out her treasured scrapbook of clippings, with photographs of him that she had been saving for the past 2 years. She never missed a newsreel in which he appeared and often stayed to see such a showing three or four times. It was all very fantastic, but she had thought it all out. When she was eighteen, she would apply for a position on a luxury liner and somehow get to Rumania, where one day at a ball given in her honor he would see her and become spellbound. She described the dress she would be wearing, the kinds of flowers and their scent on the terrace where he would propose, and even his actual words. She described at length her room at the palace, her wardrobe, jewels, and furs. Her eyes sparkled when she told how he would whisper in her ear of his love for her and of her great beauty. She would be the most outstanding woman ever to be presented at court.

When June was fifteen years old, her father remarried. June did not get along with her stepmother. Fortunately, a sympathetic neighbor offered her a home, where she ate and slept regularly and where she was kept wholesomely busy and was affectionately treated. By means of the modern arts, she was made as attractive as possible. She was kept in school, and because boys called at the house where she lived she got some dates, too. She finished high school and obtained a good position.

June tends still to be a little dreamy, but she is making a good adjustment in life and is as happy and successful as most.

Conflict—Fighting within Oneself. When Ruth was debating with herself whether or not she should buy the formal dress that cost \$10 more than another she was considering, she was experiencing a conflict—not a very severe one, but a conflict nevertheless. She had some feeling about it, was disturbed, and had a hard time making up her mind. She wanted the more expensive dress, but she did not think she should spend the extra \$10, which she really needed for other things.

Here is Jimmie, who should be studying his lessons after supper. He knows this and wants to do so, too, for he is not satisfied with his marks in his classwork and examinations. But he has been asked to join the gang down at the usual corner, and thus he experiences a conflict. On one side, duty and a feeling that he must study his lessons tug at him; on the other, the desire to go and have fun with the boys fights for affirmative action. There is a crossfire of feeling and desires within him. Jimmie had better decide very soon what to do or he will be in a bad emotional state. Of course, in this case a decision to work will produce a better feeling than a decision to play.

Much conflict centers around right or wrong. When a person has temptation before him, he is in conflict as to whether or not he should yield. A pupil knows that the teacher keeps some change in her desk. He begins thinking about it. On the one hand, he would like to have that money; on the other, he is restrained by his knowledge that it is wrong to steal and by the thought of the disgrace and punishment he will suffer if caught. He churns these thoughts over in his mind, and conflicting thoughts they are, firing back and forth. He suffers a good deal in this conflict. If he takes the money, he still suffers, because he did wrong. The only way to solve a conflict is to reach a decision consistent with what is right and good.

The persons who have conflicts are often those who are uncertain because they have feelings of inadequacy. They are worried about the outcome of their actions, and they procrastinate, putting off this

and that obligation. Not having confidence in themselves, they fear the consequences of any move and cannot make up their minds to any beginning. The doing of this task or that is postponed, but the tasks remain to be done and present themselves almost continuously to annoy the person who postponed doing them. Uncertainty, conflicts, procrastination, and a cluttering up of one's activities develop emotional tensions that produce ineffectiveness and maladjustment.

The following example is about a person who seems inhibited much of the time: Frances is so concerned about consequences that she retards herself in getting to work. She wonders whether she can do her lessons and whether she will get a poor mark if she cannot. Therefore she is slow in getting to work and wastes much time fumbling along, wondering if this or that is right. If an examination allows a choice among the questions to be answered, Frances is troubled by the thought that she is selecting the wrong questions and might do better on those which she has decided to omit. Feelings and emotions develop when she is faced with a problem, and consequently she cannot think clearly. Her judgment is impaired, and she makes many poor decisions and frets over them after they are made.

When the home and school environment are friendly and understanding, there is little likelihood that children will develop conflicts over everyday matters of ordinary concern. Of course, when there is a tendency toward behavior inconsistent with high ideals and right, it is to be hoped that conflict will set in and check such behavior. But it is better yet if a person has learned to make good decisions promptly and then goes ahead on the right course. The atmosphere of the school and home should not be a tense one, causing a child to feel that so many choices are life-and-death matters. It is the tensions, stresses, and strains that bring on a churning of the emotions or produce conflicts when options present themselves and choices have to be made. In a severe environment, children get the feeling that many relatively minor matters are of the utmost importance, and thus they soon learn to confront problems with tense feelings and conflicting questions—shall I, shan't I; yes and no; if I do, if I don't; what will happen if I do this, if I do that, and so on. Adults should permit children to make their own decisions. They should not scold them if they make what seem poor ones but in most instances should let them learn by observing the consequences of their thinking.

To avoid conflicts, one should learn to face an issue and make decisions promptly. Avoid the mistake of "passing the buck" or on the other hand of letting problems accumulate without considering them

and if possible disposing of them. One should not make snap judgments, which are little better than guesses, but should consider the evidence, think the problem through, and then make up his mind. It has been said that it is best not to dwell much on the reasons for a decision after it is made, for to do so merely entangles one further. Some decisions are certain to be poor ones, but there will be fewer of these if a person is not mentally bound by the cross firing of his feelings and wants. Even though a poor decision is made, it should not be dwelt on. One should move on to new problems.

In a school where teachers and pupils cooperate in planning the work and making decisions about it, the children learn to face facts and arrive at conclusions. They learn to test their conclusions against subsequent experiences. The opportunity to make decisions affords a wholesome situation that contributes markedly to the mental health of children.

Temper Tantrums. People generally lose their tempers when their pride is hurt or when they are prevented from getting what they want. Temper centers in the basic wants or desire for personal worth, for personal freedom, and for freedom from pain. Bad temper may also develop when other basic wants are denied.

When a young child is restrained, for example, or is held tight, he will struggle hard to free himself. A child becomes angry when restrained physically and psychologically. When little children are refused something such as a toy or a cooky, they sometimes lie down on the floor and go into a tantrum, holding their breath and kicking in an attempt to get their way. The schoolteacher, especially the kindergarten or primary teacher, may encounter tantrums of this kind in her pupils. The best procedure is to pay no attention to a child having a temper tantrum. The child will not injure himself, and if he is given no attention the tantrum will dissipate itself and the child will learn that he gets neither attention nor his own way through such methods. He is likely to give up having temper tantrums when he learns that they are futile.

Tempers are lost when one is minimized by insult or is prevented from getting what one wants. It is possible that getting angry served a purpose in the earlier development of man, for the emotion of anger called forth greater energy, which was needed for survival in a more rudimentary world. In our present world, bad temper arouses disapproval. It also upsets the mental processes; an angry person cannot think as clearly as he can when calm.

A person may have learned that anger helps him to get what he

wants. A child often gets his way by flaring up. Usually those about one do not want any trouble, and so by being disagreeable or sharp or showing a flash of temper one may get his way. Such a situation sometimes develops in a class; when it does, the teacher should not let bad manners be rewarded favorably.

Teachers, too, must learn to be calm when conditions are most provoking. For example, the room may be too warm, the supervisor has paid a visit, the children are restless, their minds may seem most sluggish, and the teacher is tired. It is all too easy to scold, to be sarcastic and angry. One of the most unfavorable criticisms pupils have of some of their teachers is that they are "crabby" and sometimes lose their tempers. When a teacher feels that her emotional temperature is reaching the boiling point, she should call a halt temporarily, tell a story, take up different work, or perhaps walk down the hall to the water fountain for a cool drink.

Anger or bad temper is a rudimentary form of behavior and is seldom very effective. The emotionalism of anger blocks clear thinking; it is hard to be sound and rational when one's mental processes are colored by the heat of emotion. Many bad mistakes are made by persons who are angry or bear a grudge; and, what is very important, such persons are unhappy. Much that people do when they are angry they regret afterward. Teachers and pupils should work together and learn self-control even under the most difficult circumstances.

Maladjustment, Mental and Physical Health. In general, mental and physical health are closely interrelated. The reader has probably heard the term *psychosomatic*, which refers to the relationship between psychological forces and the body. Worries, anxieties, failures, grief, fears, bitterness, hates, conflicts, and repressions can so change the chemistry of the body that a person having these emotional troubles actually becomes ill. It is a fairly well-established fact that emotional stresses and strain develop a chemical composition of the gastric juices which consumes the tissues of the stomach and causes a sore, or ulcer. From experience we know how sick and tired we feel when we have been through a period of sharp emotional stress.

Illness, in turn, may be an escape from one's problems, which in the first place may have caused personal maladjustment. Thus it can be a vicious circle—problems and unhappy experiences, failure and maladjustment, and illness in order to get away from troubles and problems.

Illness not only is an escape from the hardness of reality but invites special attention. A sick child gains the sympathetic attention of his

parents and friends. The doctor is called to attend him, and white-dressed nurses add to the importance of himself and his illness. Now the child is the center of attention, and his feeling of worth is increased.

A teacher should study carefully a child who gets sick because the work is hard and the tasks are unpleasant. A child who has headaches and vomiting spells and who seems to get satisfaction from his illness and from being delicate should be observed carefully. Such a child should be given a thorough physical examination, and if anything is wrong it should be remedied. It may be found that the child is perfectly well; in such a case he may be making a play for attention and attempting to escape tasks and duties that he does not like.

Escape through illness is referred to as *malingering*. Malingering is not very common but occurs frequently enough so that the teacher should be on the lookout for it.

Individual Differences in Personal Adjustment. One person gets along well in the world, has few troubles, has a great deal of happiness and so is healthy and wholesome. Another person, on the other hand, may seem to be engulfed in trouble, sensitive to life's situations, and always maladjusted. Those who are not sturdy enough to withstand the blows of even a simple environment are usually protected by being placed in a hospital.

These are the extremes, of course. Most adults and children fall between the extremes, most persons being halfway between. The degree of durability spoken of in the first example above consists not only in a resistance to the blows of life but also in a general all-round ability to get along in the world. For example, a child who has good native intelligence and good health is more likely to get along with less friction and difficulty than a child of lower intelligence and poor health. The environment always tests an individual in terms of his ability to cope with it.

There are differences, of course, in people's ability to withstand the same failures, fears, and griefs, but the amount of these experiences is in turn determined by a person's capacity to deal with the problems that confront him. Most people, however, can get along if the environment is not too antagonistic to them. It is in this connection that the school has a particular responsibility in adjusting itself to the student. The work should not be too hard or too easy but should contribute to the well-being of the individual pupil.

All people fit somewhere in the wide range from the most sturdy to the most delicate, and the environment also has a wide range in the

degree of its severity. One of our educational and psychological problems is to harmonize the individual and his environment in order to achieve maximum adjustment and personal happiness.

In a fifth grade, for example, is a fifteen-year-old girl who to all outward appearances is normal, being good-looking and healthy. But she is not endowed with enough mentality to do the schoolwork successfully. She has an I.Q. of 65, and although she is 4 and 5 years older than the average children of her grade she does her lessons poorly. She feels uncomfortable because she is larger, older, and less successful than the other children, and she is developing a nonchalant, indifferent, and dreamy attitude. She is becoming depressed and tends to remain alone. It is possible that her condition will become serious.

She should be in a special class with pupils of her own interests and capacities. An understanding teacher, specially trained for teaching dull, overage children, could keep the personalities of such pupils normal by giving them experiences that are suitable for them and that consequently will make them happy. It goes without saying that pupils of this kind will always find the world more difficult than will those with more endowment; nevertheless, if not injured permanently in school and if properly guided, they can find areas of activity where they will be successful and happy.

Every person has some complexes, repressions, conflicts, and worries, and everyone misbehaves, compensates, and rationalizes more or less. Everyone also has feelings of inferiority and escapes from the real world through fantasy. Everyone has some problems of mental hygiene, but fortunately most people do not have enough bad emotional and physiological states to influence behavior sufficiently to cause serious maladjustment. Again, of course, it is a matter of degree, ranging from the hopelessly unbalanced to those whose behavior is most effective and wholesome. A few get along in the world exceptionally well; most people are more or less well adjusted to their environment; and a few behave in a way that makes it necessary that they be hospitalized.

Escape and Defense Mechanisms. The various forms of behavior that have been described, such as fantasy, rationalization, repression, and negativism, for example, are mechanisms for either escaping from the unpleasantness of the environment or defending oneself against the conditions that tend to lessen one in the eyes of others.

When a person daydreams, he is trying to escape. Similarly, many a person drinks liquor to drown his troubles and get away from his worries. Alcohol is then used as an escape.

A person represses or hides away his memories and feelings so that

he can get away from them. He does not want them around, and so he tries to put them away. Repression is also an attempt at escape.

Rationalization is a defense mechanism. A person tries to defend himself by giving excuses or reasons for his conduct that he thinks will maintain or even improve his status in the opinion of others. Some compensate for weaknesses by being authoritative or extremely dignified in manner and thus defending their feeling of inadequacy.

Negativism, also, is a defense mechanism. Negativism is a tendency to refuse to act in accordance with a suggestion or a request. The common response of the negativistic child is "No," "I won't," "I don't want to," or their equivalent. Such a child will say that he does not want to play with other children. When a suggestion is made, he is generally against it. He is stubborn in the sense that he does not cooperate well with others.

Negativistic people take the opposite side; they tend to be contrary. Even if shown a correct method, the negativistic child or adult will not accept it, though he knows that he is wrong. For example, a girl while practicing the piano struck the wrong key and was informed by her mother of that fact. Being negativistic to her mother's suggestion, the child persisted in striking the wrong key as long as she practiced that lesson. When she resumed practice at another time, however, she struck the right key and played correctly.

The defense mechanism described as negativism is employed to maintain one's self-respect. Thus it is like some forms of compensation. By putting up a "no" around oneself or being contrary, one maintains his independence and incidentally avoids conflict.

All mechanisms for enhancing one's status in the estimation of oneself and others may be called *plus gestures*. Taking the opposite point of view, saying "No," being authoritative, being boisterous to attract attention, and exhibiting exaggerated mannerisms are plus gestures. They are symptomatic of maladjustment. They indicate that the individual is trying to make up for feelings of inadequacy.

SUMMARY AND REVIEW

On the average, 1 out of 20, or 5 per cent, of the population goes to a hospital because of serious personal maladjustment or mental illness. One out of 10, or 10 per cent, will have serious enough troubles to need psychiatric help. Nearly all persons have some personality problems of a more or less serious nature.

Worry, or overconcern, is related to fear and insecurity. Reasonable concern is a prerequisite to achievement, but typical worry, or

overconcern, results in unwholesome tensions and loss of effectiveness. Most worries are baseless. Children worry most over school and home situations.

Complexes are ideas, thoughts, and experiences which are tinged or colored by feeling and emotion. Complexes distort thinking, distort behavior, and cause periods of unhappiness. A common complex is the inferiority complex.

Conflict consists in a struggle of thoughts, ideas, and wants. Conflict causes emotional troubles and renders a person less efficient or less effective in dealing with life's situations.

Temper tantrums are fits of temper or sharp feeling. The emotion of anger is unhealthful, and trying to get one's way by a show of temper is infantile.

Much of our illness is caused by the effect of unhealthful emotions on the body. Sometimes a child becomes ill to avoid the rigors of life. The relations of the emotions to health and health to the emotions are fundamental to human behavior. Persons differ in their resistances to the rigors of life, some being much more durable than others.

Most of the mechanisms that have been discussed may be described as escape or defense mechanisms. By escape mechanisms we mean the methods used to get away from the realities of life; by defense mechanisms, the methods used to protect one's ego or feelings of worth.

Repression consists in pushing complexes into the subconscious or bottling them up. Complexes cause trouble when stored up and influence feelings and behavior unfavorably.

Rationalization consists in superficially sound but fundamentally untrue reasons or excuses. A person rationalizes to defend the self and maintain his personal worth.

Compensation consists in behavior that has as its purpose the overcoming of weaknesses or feelings of inadequacy. Some compensation consists in unsocial behavior; some in building up strong suits to cover weak ones.

Fantasy, or daydreaming, consists in building a dream world in which a person obtains for himself what he fails to get in the real world. The evil of daydreaming is that it takes one farther and farther from the real world and thus causes maladjustment.

Test Your Thinking

1. A teacher said, "The mental health of our pupils is no concern of ours because people usually don't have serious personal disorders until they are out of school." Comment.

2. List and discuss the matters that cause children to worry.
3. What can a teacher do to reduce the amount of overconcern that pupils experience?
4. Explain how unpleasant complexes can distort thinking and can also be unhealthful.
5. Explain how the inferiority complex is the result of experiences and how it influences behavior.
6. The speaker said, "Give us the good old school where the pupils sat in their seats and worked silently. They learned how to work, learned self-control and how to keep their troubles to themselves." Comment.
7. "I could get as high marks as anybody if I'd try," said Mervin, "but I've got better use for my time than studying the teacher's lessons." Discuss this statement.
8. Give illustrations of undesirable compensation and also of good compensation.
9. Daydreaming is probably a symptom of personal inadequacy. Explain.
10. A person should think over his problems, then reach a decision and go ahead on that basis. Minor matters should be decided quickly, and problems or work to be done should not be allowed to accumulate. Discuss these statements.
11. In terms of mental health and hygiene, what does it mean to escape and to defend ourselves?
12. A person should find out what is true and what is real and try to live accordingly. Comment.

References

- BONAR, HUGH S.: High-school Pupils List Their Anxieties, *School Review*, **50**: 512-515, 1942.
- BURNHAM, W. H.: *The Normal Mind*, D. Appleton-Century Company, Inc., New York, 1924.
- CASE, VIRGINIA: *Your Personality—Introvert or Extrovert?* The Macmillan Company, New York, 1944.
- CATTELL, RAYMOND B.: *Description and Measurement of Personality*, World Book Company, Yonkers, New York, 1946.
- EVANS, C., and T. R. McCONNELL: A New Measure of Introversion-Extroversion, *Journal of Psychology*, **12**: 111-124, 1941.
- FENLASON, ANN F., and HELEN R. HERTZ: The College Student and Feelings of Inferiority, *Mental Hygiene*, **22**: 389-399, 1938.
- HOWARD, F. E., and F. L. PATRY: *Mental Health*, Harper & Brothers, New York, 1935.
- JERSILD, A. T., B. GOLDMAN, and J. J. LOFTUS: A Comparative Study of the Worries of Children in Two School Situations, *Journal of Experimental Education*, **9**: 323-326, 1941.
- LANDIS, C., and J. D. PAGE: *Modern Society and Mental Disease*, Rinehart & Company, Inc., New York, 1938.

- LUNGER, RUTH, and JAMES D. PAGE: Worries of College Freshmen, *Journal of Genetic Psychology*, **54**: 457-460, 1939.
- MOONEY, ROSS L.: Personal Problems of Freshman Girls, *Journal of Higher Education*, **14**: 84-90, 1943.
- POPE, CHARLOTTE: Personal Problems of High School Pupils, *School and Society*, **57**: 443-448, 1943.
- PINTNER, R., and J. LEV: Worries of School Children, *Journal of Genetic Psychology*, **56**: 67-76, 1940.
- SHERMAN, MANDEL: *Mental Conflicts and Personality*, Longmans, Green & Co., Inc., New York, 1938.
- SHERMAN, MANDEL: *Mental Hygiene and Education*, Longmans, Green & Co., Inc., New York, 1934.
- TIEGS, E. W., and B. KATZ: *Mental Hygiene in Education*, The Ronald Press Company, New York, 1941.
- WHITTY, P. A., C. E. SKINNER, and others: *Mental Hygiene in Education*, Rinehart & Company, Inc., New York, 1939.

CHAPTER VI

MENTAL HYGIENE AND PERSONAL ADJUSTMENT

What to Look For. What may be the effects on a person if his work is too easy or too hard? What can be done to adjust schoolwork for children of varying abilities?

Learn why regular habits and a well-organized program of work, play, sleep, eating, etc., are conducive to better mental health and personal adjustment.

You may be surprised when you note how overprotecting, babying, and spoiling children affect their work habits and achievement.

Give special consideration to the problem of how children can learn to associate with each other and with adults in a normal and healthful manner.

Note how the teacher's attitudes and methods influence the mental health of her pupils.

The relationship of work, fatigue, and rest to mental health is discussed, and the importance of a well-balanced program is stressed.

Note that it is not enough to be able to identify or diagnose problem tendencies but that something of a remedial nature should be done, although such difficulties are much more difficult to treat effectively than to diagnose.

Several factors such as mental ability, physical qualities and handicaps, and socioeconomic status are discussed in relation to mental health and personal adjustment; the reader should understand how they influence mental health either favorably or unfavorably.

It is pointed out that the individual should not be lost sight of in the study of trends and general relationships and that each child should be considered individually.

Behavior problems and problem tendencies differ in their effect on the personal development of the child and in respect to the seriousness of the behavior that may follow. The reader should learn the relative seriousness of various forms of misbehavior and the principles and reasons for the classification of various problems according to seriousness.

Introduction. Wallace Norton is a healthy, happy high-school boy. He is friendly with his teachers and classmates and gets along well

at home. He will not be the valedictorian, but he classifies as a good student. He participates in school activities and is known as a good fellow. Wallace likes people, and people like him. He dates a few girls, who consider him a desirable type of boy friend. In general, Wallace is a well-adjusted high-school boy in good mental health.

On the other hand, Rudy Pyle, a classmate of Wallace, is a maladjusted boy in poor mental health. He is barely a fair student, and he feels that his teachers do not treat him justly. He is antagonistic toward his teachers and jealous and suspicious of his classmates.

Rudy worries about almost everything, and little things upset him. School activities interest him very little. Some of Rudy's classmates call him shy because he tends to go off by himself and remain quiet. Others say he is unsocial. Rudy will leave school as soon as he graduates and possibly before, even though he does not know what job he would like to get.

Rudy has an inferiority complex. Recently, he has taken up drinking, and one night he became intoxicated.

Harmony of the Individual and Work. Work is a big factor in life. One is not very old before he is given some tasks to do. The school years are filled with tasks and duties, and the consequent successes and failures control our mental hygiene to a large extent. In adulthood, happy living depends considerably on having a good job.

A person is not in harmony with his work if it is too hard or too easy. If it is too hard, too much failure is experienced; if it is too easy, it is dull and deadening. Children of a given age vary greatly in abilities and interests, with the result that they differ in the amount of success and failure they experience. When the work is too hard the frustration and failure that pupils experience cause them to develop feelings of inferiority. Their mental health and personal adjustment are impaired, and they may display unsocial behavior.

Schoolwork May Be Too Hard. Probably one of the major causes of maladjustment in school is the frustration and failure that develop from work that is too hard. It has been discovered by careful inquiry that average and retarded students show the greatest number of behavior-problem tendencies.

The following is an illustration of the effect of the blocking that hard lessons cause: A teacher asked a boy who annoyed the class a good deal by his bad behavior the reason for his conduct; he answered, "I can't get geography. I try and try. First I get warm, then I get hot, and then everything busts open."

It has been explained in a previous chapter that children who fail

in their work compensate by being mischievous. As problem cases they attract the attention of the teacher and gain recognition from their fellows, and sometimes admiration, for their bravado.

Others become shy and retiring, trying to withdraw as much as possible. This is very serious, for a child's development is greatly retarded by withdrawal from the activities about him. It may also happen that a shy, retiring person may break out in the most unexpected manner, for in the secrecy of his own private world he may acquire vicious ideas and behavior patterns.

The marking and promotional system stigmatizes pupils. Those who get failing marks on their report cards and are retarded are very likely to develop behavior-problem tendencies, and a large number of them do so. In many schools there are children who are retarded from 1 to as much as 4 years or more. Visualize, for example, fourteen-year-old boys or girls in the fourth grade with children who hardly reach to their shoulders. Of course, the big children hate such a situation, and they skip school, violate the state compulsory-attendance law by staying out of school, or leave as soon as the law will allow them to do so. They have tasted little but failure and humiliation, and they leave with a permanent distaste for school and learning.

It is doubtful that children should be failed of promotion even once. They should be kept with children of their own age and size so that they will be in a suitable social group. When possible, classifying children into ability groups will help. When this cannot be done, the dull and slow-learning child should be given special work which he can do within the group to which he belongs socially. Failure and retardation do not improve the learning ability of the child. That has been thoroughly proved long ago. The mental health of the child is a first consideration, and the teacher and school can afford to be somewhat unconventional and forget the so-called "standards of achievement" in order to help him to be happy and successful within the framework of his capacities and interests. Keep a child in his natural social group and give him work he can do successfully, and he will achieve what is for him maximum personal and academic development.

Schoolwork May Be Too Easy. There is a great range in the abilities of children of any given age. Some children never really understand what the teacher is explaining, while a few comprehend the ideas involved long before the teacher has finished her explanation. For the dull child the schoolwork is too hard, but for the very bright child the lessons may be too easy and the teaching too simple and repetitious. Thus the bright become bored and lose interest, and they,

too, turn to mischief. Often they escape from the monotony of the schoolroom by daydreaming. They enter a world of their own where their minds can find full play.

In this tendency of the bright child to enter his own world when school does not interest him is the answer to the statement that some very brilliant men were dull students. They were not dull at all; they were so bright that they found school boring, and their lack of interest was interpreted by the teacher as dullness.

A bright child will not be alert unless the school stimulates him, which it will do if the work is new to him and up to his capacities. When it is not, the bright child loses interest.

Such was the case with Harold, a sixth-grade boy who had an I.Q. of 146 and therefore would usually be classified as the brightest pupil in about 400. He did not get good marks; in fact, he just barely passed. He was not interested in reciting, and his written work was hastily and carelessly done and was seldom completed. The teachers called him a dreamer, and a few thought him dull. For all teachers he was a problem.

He was under special observation and study, and in a class the observer noted that he failed to define declarative, exclamatory, and interrogative sentences when the teacher asked him to. After class he was asked by the observer to give these definitions, and he gave perfect answers. When asked why he had not done this in class, he said, "This is the third time in my school experience that we have been asked to define the different kinds of sentences. I could do it the first time, and I see no point in doing it again."

Bright children are often problem cases, as dull children are, although the problems are of a different nature. In fact, when it was found that dull pupils showed the greatest number of behavior-problem tendencies, it was also found that bright children showed the next greatest number, more than the children of average ability, who showed fewest. This indicates that the school environment particularly and the general environment to some degree are more suitable for the average child and less suitable for the dull and the bright. The teacher should discover her bright children at the start of the term. The intelligence-test results will indicate the intellectual levels of the individual pupils, and the teacher should evaluate these results in terms of the behavior of her pupils. The bright pupil should have special opportunities afforded him such as good supplementary books and considerable chance to work independently.

The bright child should take extra work. In some instances, parents

can help by causing the bright child to take lessons in music, dancing, or drama or to have a paper route, be a clerk in a store, or do some work that will interest him. In the elementary grades the bright pupils can be used to help the other children and they can be given extra opportunity. In high school the bright pupil may take an extra subject; it will usually be found that with a larger load he will do as well as with an average load, or even better.

Extra promotion may be recommended, but this should be done with caution. Some evidence indicates that accelerated children are as well adjusted personally as children who have progressed at an average rate, but other evidence shows that too much acceleration may result in particular boys or girls being put in a group where they are socially inadequate. For example, here is a very bright boy, not very large for his age, who at fourteen is with classmates who are sixteen and seventeen years old. The fourteen-year-old is probably the best student in the class, but socially he is a misfit. The girls regard him as being too young and small for them, and the boys discourage him from being in athletics because he has not enough athletic ability. Nor do they want him around when they make dates with the girls. He is thus a misfit socially, and his personality is bound to reflect the inadequacies that he feels even though scholastically he is a leader.

It is usually better to keep very bright boys and girls in classes or grades where they will fit in socially. Sometimes a bright child is big enough physically and so advanced socially that he gets along well with children a couple of years older. It is an individual matter; the teacher should consider the social maturity of a child and the effect that acceleration will have on personal adjustment before he is given much extra promotion.

In speaking of work being too hard or too easy and in emphasizing the importance of success, it is not contended that a child should experience all success and no failure. It is impossible to control a child's environment so that he will succeed always. Actually, the general idea of whether or not a child should be successful in all that he attempts is of considerable psychological importance. For the best personal development and for the achievement of a wholesome personality a child should taste failure when he has not earned success. If a child has not done his best or if he has been indifferent, he does not deserve success. In general, the work should be adjusted to the capacity of the child so that when he tries sincerely he is rewarded with success.

Life should be neither too difficult nor too easy. If it is too hard, continued defeat results in a feeling of uselessness; if too easy, enthusiasm

is dulled and efforts become languid and aimless. A person maintains the best-balanced personality if successful most of the time, but occasionally to grapple with a problem that he cannot solve until the answer is explained to him can be healthful also.

Definite and Orderly Methods of Working and Playing. One of the best friends of mental hygiene is good and regular habits. Much in life depends on regularity and system. One child can go about the day's activities, from getting up in the morning to going to bed at night, with complete dispatch and with no delay or lost motion. Other children waste time here and fritter it away there. They are not sure whether they should do this or that and are uncertain and confused much of the time. The lack of definite and orderly habits is conducive to bad mental health.

Here was James, a pupil who seemed always to forget to bring his books to school. His pencil and paper were often where he could not find them, he did not know what to do next, and apparently he could not "get down to work." He was very unpredictable.

On the other hand, Ann Marie had a definite program for the day. She got up at a given time. She practiced the piano 1 hour before breakfast, which she had each morning at the same time. Throughout the rest of the day she proceeded systematically with very little lost motion. Every bit of what was important had a definite time and place. As a result, she accomplished a great deal, was happy, and had ample time left over for play and recreation.

One should not be a devoted slave to habit but should have definite procedures in order to accomplish his work and maintain his peace of mind. The teacher can make an important contribution to her own mental health and that of her pupils if she is systematic and orderly herself. She should be clear and definite in giving directions or making assignments. The pupils should know exactly what the problems are that face them. When a pupil says, "I don't know where we are at and what we should do," an unwholesome situation exists. It is desirable, not that the teacher be dictatorial and autocratic, but that her leadership be so clear and positive that the pupils go about their work in an orderly manner.

Overprotection of the Child and Maladjustment in the Home. One of the factors that we have considered in relation to mental hygiene and personal adjustment is the situation where life is too easy or where one is able to do easily all one's tasks. The phrase "all success and no failure" was used in this connection, although in a true sense the doing of tasks that are too easy for one is not real success.

Related to this factor in mental hygiene is the factor of overprotection of children by their parents. In an attempt to help their children, parents will baby them and overprotect them from the experiences they normally would have. Such children, indulged and pampered, are sometimes described as being raised in a hothouse environment.

Overprotective parents keep their children from playing much with other children, especially if the playing is vigorous. When their children have a dispute with others or come home crying, such parents take the side of their own children whether they are right or wrong. Overprotected children have few, if any, duties to perform; figuratively speaking, they are raised on bonbons and never learn to stand alone. In short, such children are spoiled, with the consequence that they are overdependent on their parents and never become emotionally mature.

A study was made of the work habits and social adjustment of children from homes (1) in which the children were babied and (2) which were well adjusted and in which the children were treated wholesomely. These homes were well known, for a close relationship with the parents was maintained, and extensive records were kept.

Included here are two groups of children:

1. Those babied by the parents, with records as follows: "youngest child of family and is spoiled"; "child is indulged and pampered."
2. Home well adjusted: "ideal home with interested and understanding parents"; "home normal and cooperative."

The children were evaluated according to their work habits as being good or poor. The results are startling. Two sets of records were used. On the basis of these it was found that of the babied or overprotected children about $\frac{3}{4}$ to $\frac{4}{5}$ had poor work habits, and thus only $\frac{1}{5}$ to $\frac{1}{4}$ had good records. But with children from the wholesome, well-adjusted homes the situation was almost exactly the opposite: about $\frac{3}{4}$ had good work habits, and only $\frac{1}{4}$ had poor records.

These children were also evaluated for the effectiveness of their social adjustment, and about the same differences were found between the babied and the wisely treated children. About 80 per cent, or $\frac{4}{5}$, of the babied children made a poor social adjustment or did not get along very well with others, but a little over 70 per cent of the children from well-adjusted homes were also well adjusted socially and a little less than 30 per cent were not.

Here we have most important data showing the effect of the home on the work habits and social maturity of children. The data show convincingly that the home contributes most significantly to the work

habits, social maturity, and general mental hygiene of the child. When the teacher is trying to understand the child, she should look to the home for an explanation of why a child is as he is. Both the heredity and the home environment of the child will help the teacher interpret him.

The babied children's poor work habits required that the teacher encourage and supervise them and also exert pressure in order to induce them to work. The babied children did not work up to their capacities, and their progress was slow, and therefore the teacher had to give them special attention. Their work was careless, and their methods of work were irregular. This applies to the schoolwork of 60 to almost 100 per cent of the babied children but would be true of the schoolwork of less than 25 per cent of those who came from well-balanced homes.

Emotional and Behavior Reactions to Other Persons. We have been speaking of social adjustment, which to a large extent is the ability to get along successfully with others. When children are shy in the presence of other children and adults or feel ill at ease, they show a form of behavior that is not healthful. It cannot be corrected by telling a child he is shy and that he must get over it. Emphasizing his weakness may only make it worse. He is probably shy because of feelings of inadequacy, which no doubt have been caused by experiences he has had. The problem is to lead the shy child into new experiences that will cause him to be happy.

The school, of course, is only one part of the child's environment. The home has influenced the child for 5 or 6 years before the school has a similar opportunity and continues to affect the child after he begins school. The child has playmates outside of school and home, and they influence him, too.

Mental health and hygiene are concerned also with how boys and girls get along with each other. Friendly and natural relationships between members of opposite sexes is a healthful symptom. When a girl and boy are ill at ease in each other's presence, we have a symptom of maladjustment. It may not be serious, but attention should be directed toward bringing about relationships that are free of shyness.

In connection with the problem of training children in cordial and wholesome personal relationships, free of feelings of personal inadequacy, it should be noted that talking to and lecturing the individual about his weakness will be of little help and in fact may even increase his inadequacy. But teachers and parents can help by teaching children what to do in social situations and particularly by affording them social experiences. There is a body of knowledge pertaining to social eti-

quette and manners that children should learn; acquiring that knowledge and applying it in actual situations will put many children at ease. Some children feel uneasy in social situations because they have not learned certain mechanics of behavior. Anything the teacher can do to inform young people how to act will contribute to their mental health and social adjustment.

A program of physical education beginning in the kindergarten or the first grade and continuing through the grades will develop children socially. Such a program provides that they play together under supervision, that they learn to talk to each other and give and take, and that they have common interests and so acquire the ability to deal with each other and get along in a group.

In many schools the opportunity for training the pupils to get along in a group and with members of the opposite sex is lost. Worse still, social isolationism becomes a habit.

A school of about 350 elementary-school pupils had a good playground and gymnasium, both near the school building. Before school began in the morning and during recesses and the noon hour, the children were not on the playground at all and a few aimlessly ran in and out of the gymnasium. Some ran back and forth through the halls, up and down the stairs, and in and out of the toilets. Others stood around in the corners, showing each other their jackknives and toy pistols. A few were running about the school grounds. There was no organized group activity, no learning to play together, no development of wide friendships and team play. There was a minimum of learning to get along together in a group.

It would have been easy to organize the activities of these children into group games. The children who were transported by busses to the school from different parts of the neighboring rural section could have got to know each other better. They would have learned to get along in a group instead of splitting off into little segments as they did.

Strong competition in games involving all the children is often not good for mental hygiene, for only the few good ones succeed, and many feel inadequate. When children are definitely ranked for their playing abilities, many of the less able ones will lose interest and drop out. The games and activities of the school should be for the fun there is in them and for the health and social development of the children.

The Teacher, a Friendly Atmosphere, and the Mental Health of the Pupils. One of the chief concerns of the pupil is about his relationships with the teacher and how he is getting along in school. The

worries and fears and the stresses and strains of the school child constitute bad mental health, which is not conducive to the development of a healthful personality.

The teacher can do much for the mental health of the pupils, for she is the principal cause of the atmosphere that exists in the classroom. If she is friendly, sincere, and sympathetic and encourages her children, fills in their weaknesses, and expands their strengths, she will develop a classroom atmosphere in which the shy will be less sensitive, the inadequate will feel more able, and the strong will grow wholesomely.

The good teacher shows her appreciation of the efforts of her pupils by praising sincere work, by recognizing improvement, and by never allowing to go unnoticed the contributions that individual children make to the progress of the class. Such a teacher can help satisfy the wants of her students for worth, for security, for activity, and for freedom.

Usually the poor teacher is one who teaches neither the pupils nor the subject matter well. She leaves her pupils dissatisfied, thwarted, upset, and overconcerned. They do not master the subject matter satisfactorily and are frequently in a state of confusion.

There are still other teachers who in the traditional sense are good teachers of subject matter but who are not good for the students because of their effect on their mental hygiene. Such a teacher was Miss A., a sixth-grade teacher, who was a taskmaster and "got the work done." Assignments were definite, and during recitation the achievement of the pupils was thoroughly tested by the teacher's questioning. Examinations and written work covered the facts of the lesson and were carefully marked. There was nothing slipshod about Miss A. Her discipline was strict, she was stern and sharp, and "one of her looks" would freeze almost any child in his seat.

Children were afraid of her, and they felt tense in her room. Miss A. was also tense and rarely ever relaxed into a smile or laughter. She was not imaginative but got results by "hammering away" at the lessons and pupils.

Children in her room were not happy. It was in her grade that the older boys dropped out of school. The atmosphere of the room was not conducive to good mental hygiene. Some pupils feigned illness in order to stay out of school, and others actually had headaches and indigestion. Even though parents did not like the effects of Miss A. on the personality of their children, they did concede that perhaps they were getting a thorough training in subject matter.

Teachers should be relaxed in dealing with their pupils. Friendliness

will accomplish much more than authoritarianism. A teacher who has the good will of her pupils is contributing to their emotional well-being and also has a relationship with her pupils that is conducive to their learning to think better and learn more.

It is said that teachers should teach children and not subjects. They must do both. Good education is not a matter of the one or the other. A teacher can be so dominated by a desire to teach the subject-matter content that she does not sense what she and her methods are doing to the feelings and attitudes of the children. On the other hand, the teacher should be excellent in the sense that the children not only acquire skills and knowledge but also develop well emotionally. It is possible for her to be skillful not only in developing the children's ability to get along with others, to overcome their fears, and to be happy but also in teaching the subject matter. In practice, subject-matter teaching and child teaching can go hand in hand; and it is more usual for a teacher to be successful in both than in one alone. One can be distrustful of an educational situation in which, figuratively and literally, the pupils are on one side of the desk and the teacher on the other. If children feel that the school situations are fair and impartial, that working diligently is worth while and satisfying, and that the teacher is their friend rather than a taskmaster, one may be reasonably sure that they are in an environment conducive to good mental hygiene and good personal development.

Work, Fatigue, Rest, and Mental Health. A child may be tired for many reasons. His diet may not be good, being too starchy and sugary, for example, and deficient in vitamins and minerals. He may be going to bed too late at night and not getting enough sleep.

It is possible that his schoolwork keeps the child highly keyed up emotionally. Such an emotional state induces fatigue. But usually a child is not overinterested in his work, and taut states are not ordinarily the result of such emotional keying up. Yet it can happen that very stimulating teachers overstimulate their pupils.

Because in some instances this is so a psychologist suggested that it might be desirable for students during the day to have one dull, uninteresting teacher. Then they would pay only indifferent attention, their minds would wander, and they would have a period of rest. Even though dull teaching spaced in this way might contribute to mental health, a better approach is to schedule a physical-education period when pupils could best use a change of activity.

More often, children become fatigued from the boredom of the work. Many find it too difficult, others uninteresting, and some dislike

their schoolwork for other reasons. Whatever the reason, some children are tired of their schoolwork.

Work pitched either very high or very low causes fatigue and contributes to poor mental health. Periods of play and recreation interspersed with the traditional schoolwork will relieve tension and cause the pupils to be rested. The teacher should watch carefully for signs of fatigue in her pupils. It may be desirable when a child seems fatigued to consult the school nurse. If no school nurse or doctor is available, the teacher can talk with the child, try to find the cause of his fatigue, and then attempt to remedy his situation and condition.

DIAGNOSIS AND TREATMENT—THE PROBLEMS OF MENTAL HEALTH

It is comparatively easy to analyze a child and describe him as shy, high-strung, or overconcerned, or as having bad work habits and compensating. It is a little more difficult to explain why a child behaves as he does. The most difficult problem of all is to correct his behavior.

In reading the literature on mental health and child behavior one is impressed by the large amount of work necessary in a given case in order to improve behavior and how often the results are discouraging. There are, of course, many instances where results are encouraging, however.

There are many reasons why it is difficult to make several favorable changes in a child who is maladjusted. The degrees of maladjustment differ; the severer the degree, the harder it is to make changes. In the case of shyness, for example, if the shyness is of the "first day in school" variety, it can soon be overcome if the kindergarten or first-grade teacher is cordial and friendly and guides the shy children in joining the group. But if the shyness has been characteristic of a pupil for a long time and is deep-seated, having its roots in social inadequacy and nurturing in a home where the child is isolated from other children, it will be very difficult to overcome. It will be very hard to change a sensitive, underconfident child to one who has confidence and is a good mixer with other children.

Similarly, if a child has high scholastic ability but is a problem case in school and has been so for a long time because of dreaming, indifference, poor work habits, poor marks, and misbehavior, the teacher will find it very hard to bring about much change, especially if the child has progressed as far as the fifth or sixth grade and such characteristics are definitely in evidence.

Usually the school is only one factor in the maladjustment or readjustment of a child. The home remains probably much the same,

the child will have the same companions, he will probably have about the same reading interests, and (what is very significant) he continues to have the same fundamental nervous system, glands, and senses. All these factors and forces continue to operate pretty much as they have, making it all the harder for the school to effect many favorable changes in any given child.

The teacher should make a realistic approach to any problems growing out of the mental health and behavior of her pupils. It is essential that she have an objective attitude toward her problem pupils and not develop any personal dislike or resentment toward them. The attitude of the teacher should be that of a physician. A doctor does not get angry at a person for being physically sick. Similarly, when a person's mental health is not good, we should not become angry either, although such a person is often disagreeable and exasperating.

The attitude of the physician is best—that of trying to help a person and make him well and wholesome. The teacher will find it comparatively easy to analyze and describe the personal problems of her children and hard to do much about it; but if she is patient and will preserve an experimental attitude, much can be accomplished with some pupils.

SOME PERSONAL CHARACTERISTICS THAT CONTRIBUTE TO POOR MENTAL HEALTH AND MALADJUSTMENT

The person equipped with a good mind and body can cope successfully with the problems that face him, as one poorly equipped cannot, and consequently is likely to be in good mental health. He has the qualities that will help him adjust to other people. His good mind and body are no guarantee that he will adjust well, but at least he is not handicapped for doing so. On the other hand, the person who is dull and unattractive physically will usually find the world hard to get along in. The many rebuffs and failures of life induce poor mental health and maladjustment. But let us consider specifically what are frequent causes of maladjustment.

Mental Ability and Adjustment. The school, with its lessons, tests the mind almost hourly. Children vary widely in their mental capacity for coping with the many tasks that confront them. Some succeed easily; some have enough success to be emotionally healthy; but some have not enough mental ability, fail their individual lessons, and are not promoted. The last-named group are soon large for their grade, feel out of place, and strike out to assert their personality. The mental health of these failing and retarded children becomes poor, and maladjustment is their lot.

Studies have revealed that children of low mental abilities, those

with I.Q.'s under 90, tend considerably more toward maladjustment than do other children. In the adult world there are more criminals, beggars, prostitutes, and insane and in general more socially and economically inadequate persons among those with I.Q.'s under 90 than among those who are brighter. Intelligence is a big factor in adjustment. This is obvious enough, for a person who can think better gets along better and so is better adjusted.

There are, of course, many with enough general intelligence to get along well who for other reasons do not do so. There are also many with limited intelligence who do get along in the world even though they are sailing rough waters in a very small boat. They often find a calmer surface where they can stay afloat without too much trouble.

Very high intelligence can be a factor in maladjustment, too. It is a common notion, for example, that geniuses and very gifted persons are maladjusted. This is often true. In the first place, some inherit a nervous, glandular, and organic system that predisposes them to instability. Also, it is conceivable that a very gifted person is sufficiently out of line with other, more ordinary types so that he is maladjusted in relationship to them.

In school, for example, the very bright child may be bored with the mediocrity of his companions and also with his lessons. He will turn to his own interests and on becoming absorbed in them may soon be regarded as different from other children. Moreover, a very bright person may see so many weaknesses and defects in the world and its people that he criticizes them sharply or turns to a world of his own making. This may result in poor mental health and maladjustment.

It must be remembered that mental capacity is not a single factor that operates consistently to influence mental hygiene and adjustment. People of all mental abilities have their problems of personality and behavior, but those of less than average intelligence have the greatest number, though there is a tendency for this to be true also of those with very high mental capacities. Mental ability should at least be considered in connection with personality and adjustment.

Physical Traits, or Characteristics, and Adjustment. There are several physical characteristics that may be the cause of personality difficulties. These are health, fatness, thinness, tallness, shortness, and physical defects.

Sickness and organic weakness in themselves constitute maladjustment. A sick person is unable to live normally, he is deprived of his freedom, and his mental health is often in danger. There are the ill who are cheerful, but morbidness is more often the case.

Persons who are afflicted with many colds, who have poor digestions, or who have very little energy are handicapped in getting along with people and are prone to maladjustment. Their pains and weaknesses cause them to feel inadequate, and thus their mental health is affected. They tend to be sensitive and irritable and are easily upset. They expect to be pampered because they are not so strong as others. A person weak in health tends to be in bad mental health directly because of his weakness; his weakness causes him to contend poorly with the rigors of life; and this accentuates the maladjustment.

A child who deviates considerably from the average in physical appearance is likely to reflect some consciousness of that deviation in his personality. The very tall child develops sensitiveness and withdrawing tendencies because of his height, and the very fat child does likewise. Usually the tall child is thin, and he is given a nickname like "Skinny," "Spike," or "Ribs." The fat child is called "Fat" or "Punk" or something like that. Such nicknames emphasize to the child his physical condition and increase his discomfort, with consequent maladjustment. The child who is very small and short is often called "Shorty." His nickname is a persistent reminder of what some regard as a disadvantage. A small, short person may try to compensate for his condition by "not being afraid of a fight," by mischief, or by hyperactivity.

A teacher should look for unfavorable behavior symptoms among her pupils who deviate considerably from the average in size. She should also look for withdrawal tendencies and compensatory behavior from her pupils who are unattractive in face and figure. Not all will show poor mental hygiene because of their appearance, but some will. Sympathy, kindness, special attention will help. If the teacher earns the full confidence of her pupils, she can help them groom themselves so that they will look better. The teacher can show the child the need of developing a good personality and how to do so. Such compensation is very desirable.

There is no rule to follow and there are many exceptions, but the teacher should be on the lookout for personality problems. She will find that some persons who have every apparent reason to be well adjusted are not. For example, Mary J. was such a girl. She was fifteen and a high-school sophomore. She was bright and did well in her lessons, being one of the best students in the sophomore class. She was very attractive physically, being slightly over average height and attractive of face and figure. Her hair was the kind that poets rhapsodize over. Yet she was stiff and ill at ease with people; she had no close friends and

seemed burdened with worries and complexes. She was not happy. Apparently she had the equipment needed to get along well in the world, but careful analysis of her situation revealed that she had been pampered and spoiled by her mother and had been shown little attention by her father. She had been overprotected by one parent and left stranded, so to speak, by the other. This lack of equilibrium in her bringing up caused maladjustment in a child who had the natural endowments that constitute a head start in getting along with people.

Physical Handicaps and Adjustment. Some children are physically handicapped, being crippled or suffering from sensory defects. The child with a hunchback, a crippled leg, a shriveled arm or an arm missing, a conspicuous birthmark, a spastic condition, poor sight, or defective hearing is handicapped in getting along successfully. He is likely to develop a feeling of sensitiveness and inferiority and a tendency to withdraw from relationships with people. The bad mental attitude of the physically handicapped can be made wholesome or can be much improved if the teacher works with them and tries to build up their morale. The procedure has much in common with the treatment of children who are very tall or short or fat or thin.

That the physically handicapped can make a good adjustment was demonstrated in the case of Fred B., who was small and had a conspicuous curvature of the spine. In the first place, he acquired a good education, and he always tried to be especially courteous and agreeable. The result was that people treated him with friendliness and respect, and he developed many happy relationships. He showed a slight tendency to compensate for his physical weakness by attempting to give the impression that he was an outdoor man with a liking for fishing and hunting and that he drove his car 80 miles an hour. The tendency was very slight and because of his friendliness and kindness was hardly noticed. The fact was that he had many friends and was successful and essentially happy.

A teacher should take the time to tell all her pupils, but especially the physically handicapped, that if each person makes himself attractive personally and is friendly to others he will in turn have friends and is likely to be happy. Except for the unfit, and within reasonable limits, no matter what a person's advantages or disadvantages are, it is the individual's responsibility to get along in the world. He has to feel, "I can't blame anybody but myself, and I shall make my own way. If I am kind, friendly, and cordial, people in turn will be that way to me. On the whole and on the average, people get in this world what they earn. I shall try to earn much for myself."

The Social and Economic Conditions of the Child. The homes of children differ as greatly as the children themselves. The home gives the child both his heredity and environment and consequently is of first importance in determining what a child is and what he is going to be.

In some homes the parents are well educated, have wholesome personalities, and are leaders in the community. They have good incomes so that the houses they live in are modern, attractive, and well furnished, and there is plenty of money for food, clothing, recreation, and cultural activities. In such homes the children have many advantages and tend to develop confidence and a feeling of worth.

In other homes the parents are poorly educated and because of poor incomes can provide only poor houses and the barest of necessities. They are harassed by the needs of the children for food and clothing, and the children are raised in an atmosphere of anxiety and fear about the father's holding a job and his ability to provide food, clothing, and shelter.

In the one home the children are never embarrassed because they cannot have skates, tennis rackets, or money for the school party or dance. Their clothes are good; they are never ill at ease because of their clothing as are the children from the other type of home.

Homes range in the socioeconomic level between these extremes, and there are some home situations that extend beyond the types of homes described. The socioeconomic status of the home influences a child's personality. Fortunately, in American schools a pupil can exercise leadership according to his capacity, independent of his home background. Thus many pupils overcome the psychological effects of the home situation.

However, in trying to understand a child and interpret his feelings and attitudes, the teacher should inconspicuously look into his socioeconomic status. Perhaps a pupil has not been invited to parties because he has poor clothes and little means. Perhaps he does not get acquainted with other children for the same reason. Children may be so conditioned by the home background that they tend to retreat from social situations. Some are unfavorably developed socially because they have had too much ease and luxury. Both extremes are likely to have unwholesome effects.

Need for Individual Case Study. The teacher must always remember that there are no rules to go by in judging who will be maladjusted and why. It is well to keep in mind that children who are dull or exceptionally bright, those who deviate physically a good deal from the average,

those who are physically handicapped, and those with unfavorable home background and poor socioeconomic status are likely to have problems of personality, though they may not. Problems may show up where least expected.

The teacher should regard the pupils as individuals. When misbehavior or an unfavorable personality symptom is noticed, she should study the child in question, take an inventory of his assets and liabilities, look into his home background, and try to arrive at a conclusion as to why he is as he is. Then, after identifying the causes as best she can, she should set up a remedial program. If special attention and changing the child's school program do not work, something else should be tried. At all times, an experimental point of view should be maintained. Ordinarily some method will be hit upon that works.

BEHAVIOR PROBLEMS AND DISCIPLINE

Certain behavior is considered acceptable because it is thought to contribute to the progress and happiness of the individual and the group. Other behavior is considered undesirable in that it is disturbing and wastes time. The teacher is most sensitive to student behavior that causes disturbance, such as noisiness, whispering, talking out loud, and general disorder, for if she can maintain a quiet, orderly room she is generally regarded as a good disciplinarian. Most principals and teachers feel that the behavior of the children is being properly developed if the pupils cause no disturbance.

Neither teacher nor principal, however, should regard the problem of child behavior as being solved by merely maintaining order. Earlier discussion indicated that emotions, feelings, and motives are the bases of maladjustment, which calls for more than external order and discipline. In fact, the kind of quiet that results from a teacher's vigilance is often conducive to poor mental health. By acting as both foreman and policeman the teacher maintains order but suppresses her pupils in doing so. The result is not conducive to natural and wholesome development. A child does not learn to be truthful and self-reliant in such a situation. Character does not develop in an environment in which the child is completely ruled by the teacher. A wise observer said, "A liar is born of fear on the one hand and tyranny on the other; truth comes from the lips of courage. It is born of confidence and honor."

A child grows best in an environment where he is free to express himself in socially useful ways. Freedom of this sort does not imply that control and guidance be abandoned but rather that they be used with a view to stimulating the child to increase the variety of his in-

dependent responses. Teacher control of the typical sort that maintains order and established procedures by the rigorous compulsion method does not develop the independence, initiative, and self-control of the pupils. Their overt behavior in the classroom may not be disturbing, but they will not have learned how to conduct themselves without supervision.

An illustration of this point is the following: A young man became the principal of a small school where the pupils' misbehavior had interfered seriously with the school's effectiveness. The discipline had been so poor that the school situation was described as chaotic. If complete expression and lack of inhibition contribute to mental health, then these children had no repressions or complexes. It is probable that they had better mental health during the year of extreme disorder than they did after the new principal took charge with a firm hand that established strict discipline.

The school was transformed from a chaotic state to a very orderly one. The children marched into the school building and out of it, keeping step. No talking or whispering was allowed. They were not permitted to enter or leave the schoolhouse informally, quietly talking to each other as people usually do when they enter or leave a public building. Even the activities on the playgrounds were closely supervised. The principal or another staff member was always on the grounds with the children to make decisions and to prevent any possible confusion.

To the townspeople it appeared that the school was very well operated. As they expressed it, "Everything is running smoothly." There was no disobedience, and the teachers were in control. State inspectors, too, regarded the school as maintaining good standards of behavior and achievement.

The test, however, of the effectiveness of a method of control and discipline is the behavior of children when the supervision of the teacher is removed. Will the children carry on by themselves? Have they learned to be self-reliant and to exercise self-control? In the present illustration, the method was found to be a failure when the children were left to themselves. During one recess the members of the staff were called to a meeting, and thus the children were left on the playground without supervision. They did not engage in organized games, as they always had under the direction and guidance of a teacher. Instead, they ran about the grounds helter-skelter, throwing missiles at each other, the bigger boys hurling the smaller boys on top of each other in great piles. There was complete disorganization, complete

breakdown—a discipline that had seemed good went to pieces when the control was removed. The children had not learned to govern themselves, for the restraining force was imposed upon them from without. The strict methods employed by the teachers and principal made the children like horses that could be driven but ran away the moment the driver dropped the lines and left the wagon.

This illustration brings to mind an attempt to solve the problem of the sharecroppers by putting them on 40-acre farms to operate independently. The plan did not work because the sharecroppers had always been under strict supervision. Someone else had always made the decisions for them, decided what to plant, when to plant, when to harvest, and when to plow. These same farmers on farms of their own did not succeed because they could not do anything independently. They had never been trained to carry on alone or to control themselves.

In a country with a strong dictator the people may seem well behaved and satisfied. Generally, however, the time comes when the force of the dictator fails to suppress the people and they break out in serious disorder. The power of good behavior develops best in a democracy, and this principle applies to a school as it does to a nation. If the teacher wants to develop in her children the power to behave well when they are out of her sight, she must teach them to share with her the responsibility of control.

The school should try student government. Experience has indicated that, if student government is carefully established and pupils are trusted by the teachers and principal, they will assume responsibility and discharge their duties creditably. When the students realize that their own welfare is in their own hands instead of in the teachers' alone, they take an entirely different attitude toward their behavior and that of their fellows. Furthermore, children should be learning the democratic processes, and there is no better place and way to learn them than in the school through representative student government.

Misbehavior and Its Seriousness. There is much behavior among school children that is considered undesirable and that is often referred to as *problem behavior*. In the adult world, there are many whose behavior is unsocial in various degrees. When such behavior is serious enough in its effects, the offending person is arrested, tried, and if found guilty given a jail or prison sentence. The purpose of the sentence is twofold: (1) to protect society from the criminal's unsocial behavior; (2) to reform the guilty person so that he will not again thus offend.

In school, children misbehave in many ways. What constitutes

misbehavior varies according to the standard of the teacher and the school. In some schools the teacher stresses that the pupils must not whisper. In others the pupils work together, talking and exchanging ideas, and whispering is not a problem. Usually a teacher is concerned about behavior that disturbs the class or causes disorder.

Another type of misbehavior should receive the special attention of the teacher, although it may cause no disturbance—the type of behavior and attitude incompatible with the wholesome growth and development of a child's personality. It has various aspects of bad mental health, such as unhappiness, depression, being unsocial, withdrawing, and becoming easily discouraged. These characteristics do not cause the teacher and the class much trouble but are very serious in terms of the child's personal welfare.

In 1928 a study was made by Wickman of the seriousness of behavior problems as rated by teachers and mental hygienists. It was discovered that teachers and hygienists showed very little agreement. In a more recent study it was discovered that teachers and hygienists show much more agreement. What has probably happened is that, with psychological training, teachers have taken a different point of view toward behavior problems. Also, hygienists have probably a greater appreciation of the teachers' point of view.

Various types of behavior of fifth- and sixth-grade children, ages ten to thirteen, were rated by 395 teachers and 63 hygienists (34 psychologists and 29 psychiatrists) who worked in child-guidance clinics, psychiatric hospitals, mental-hygiene clinics, courts, welfare bureaus, and personal-adjustment services in colleges and universities. It should be noted that these teachers and hygienists interpreted behavior from a wide range of background and experience.

The following are the characteristics of behavior or manifestations that are considered most serious:

Unsocialness—withdrawal	Resentfulness
Cruelty—bullying	Suspiciousness
Unhappiness—depression	Nervousness
Fear of persons and situations	Unreliability
Stealing	Overcriticalness of others
Becoming easily discouraged—giving up easily	Cowardice, physical

Some phenomena that the teachers thought serious the hygienists did not think of as significant. These were heterosexual activity, obscene acts and talk, untruthfulness, masturbation, and destructiveness.

It will be observed that the traits and behavior considered most serious are those having to do with mental hygiene and personal qualities rather than overt, troublesome behavior. Cruelty and stealing are exceptions to this in that they represent outgoing behavior, so to speak.

Such traits as unsocialness and withdrawal, unhappiness, fear, and nervousness are introversions of feeling largely. This is also true of suspiciousness, resentfulness, and cowardice. These are personal qualities that handicap one very seriously in getting along with people and are also evidences of a failure to do so. They are qualities saturated with unwholesome emotions that prevent good personal development and may lead to very serious maladjustment. They are not so easy to detect by the teacher as more overt behavior, which impinges on group consciousness. The teacher must be on the lookout for these serious symptoms of poor mental health and maladjustment. When she discovers these serious problem tendencies, she has the task of trying to set up remedial influences.

The phenomena that are considered least important are as follows:

Whispering	Interrupting
Disorderliness	Thoughtlessness
Restlessness	Tardiness
Inattention	Smoking
Profanity	Slovenliness

Shyness and sensitiveness are still considered less serious by teachers than by mental hygienists. On this point the mental hygienists are probably sound. The teacher rates shyness and sensitiveness as less significant because a child with these characteristics causes no disturbance. But they are an introversion, or moving inward, of very unwholesome emotions that hinder the growth and development of a healthy personality and consequently are very significant.

Note that the pattern of the less important traits includes behavior in relation to others. While annoying, such behavior is not symptomatic of very bad mental hygiene and does not have a very adverse effect on the growth and development of personality. The less important traits are not emotionally introvertive, and they are not saturated with unwholesome emotional states as are unsocialness, cruelty, unhappiness, fear, and others that are considered most significant by both teachers and hygienists.

The teacher is often most troubled by the children who are high-spirited, lively, and likely to engage in mischief and play pranks.

Children of this kind are truly wholesome. If the teacher treats them with a little patience and humor, she will find that they almost always are easy to become friends with and that they respond readily to guidance.

On the other hand, the child who stays by himself, who does not laugh and play but seems unhappy, who is shy and fearful, and who becomes resentful even of well-intentioned treatment is hard to reach. Such a child does not respond readily to friendliness, and his good will is hard to gain.

The way the boys were being raised in a certain family was a source of great worry to their neighbors. The boys were very active in the house and scrambled and jumped about almost as they might in a gymnasium. But their parents were patient and sometimes even joined in their vigorous play. The house and furniture suffered, and when the neighbors dropped in, often they did not find the house in as good order as it should be according to the typical housewife's standard. The neighbors predicted that the boys would turn out to be hoodlums and ruffians but they did not. They became as fine young men as parents could hope for, and incidentally, now that the boys have grown up, the house has been completely redecorated and equipped with new furniture.

On the other hand, the children in another family were "well behaved"; the house was never "rumpled up" by them. The children were fearful of their parents, who ruled them with an iron hand. The children were not happy in the home and tended to withdraw from each other and go about their own interests. Each developed a suspiciousness that his brothers and sisters were getting more from the parents than he was. Casual visitors in the home, noting its orderliness, concluded that the children were quiet and well behaved—and so it seemed.

But as the children grew older, maladjustment showed itself in one after the other. An older brother took to drinking and became an alcoholic. A sister left school and before she was eighteen married a man whose principal claim to any girl's attention was a cleverly executed little mustache. The marriage soon was terminated by divorce. Another brother became a playboy whose emotional cocktail consisted of fast automobiles, girl companions, and gambling; before he was twenty, fast driving took him to a dead stop.

In one family, what seemed like misbehavior to the uncritical observer was really wholesome behavior for healthy children. In the other instance, a thoughtful and understanding observer would have noted unhealthy childhood behavior although there was nothing very

overt or troublesome. The resulting behavior and adult adjustment in both instances are what is to be expected in terms of mental health and hygiene.

A teacher conscious of the mental health of her pupils will be on the lookout for unfavorable symptoms such as unsocialness, shyness, withdrawal, unhappiness, cruelty, fear, suspiciousness, faultfinding, resentfulness, and becoming easily discouraged. On the other hand, the pupil with a joke and prank, the one given to extroverted, harmless mischief is not a serious problem. In fact, he may be very wholesome. The teacher should encourage the pupils with serious tendencies to be extroverted and participate in group activities.

SUMMARY AND REVIEW

When a person is happy and satisfied in his environment, he will be in good mental health. A pupil should fit the work he has to do, and the work should fit the pupil and therefore should be the kind of work in which the pupil can succeed and make progress.

Following a well-organized program of work, play, and rest is conducive to better mental health. Irregularity, procrastination, uncertainty, and conflict contribute to maladjustment and, in fact, are symptoms of maladjustment.

Seventy-five per cent of the children from homes where they were treated in a normal and healthful manner had good work habits, but only about 20 to 25 per cent of the children from homes where they were babied or spoiled had good work habits. Nearly 4 out of 5 of the babied children made a poor social adjustment in school, but a little more than 70 per cent from well-adjusted homes made a good adjustment in school.

If a child is shy, overaggressive, or in general ineffective in his relationships with others, he should be skillfully guided into social activities and helped to make a good adjustment.

The teacher should develop a healthful, wholesome atmosphere in the classroom and should teach both pupils and subject matter with a view to maximum individual development both personally and scholastically.

A child's physical and psychological condition should be under observation in order to detect fatigue. Work and rest should be varied and alternated so that fatigue will be prevented if it does not exist or cured if it does. Attention should also be given to the diet.

It is comparatively easy to diagnose problem cases but hard to cure them. The teacher should take a professional attitude toward her

problem cases and should help rather than punish them. Each child should be studied individually.

Factors in personal adjustment are mental ability, physical traits and handicaps, and the social and economic status of the child and his home.

School children should be taught self-control by being guided in the principles and practices of self-government. Discipline and control maintained by the "strong arm" of the teacher does not teach self-control.

Behavior traits and manifestations such as unsocialness, cruelty, unhappiness, fear, stealing, resentfulness, suspiciousness, and overcriticalness result in social immaturity and represent personal maladjustment that may end in serious illness. On the other hand, whispering, disorderliness, restlessness, and various troublesome activities in the classroom of a similar nature are not serious, for they are not symptoms of poor mental health and do not interfere seriously with the development of a wholesome personality. The teacher should interpret behavior more in terms of the pupil's development and less in terms of the extent to which it disturbs traditional classroom procedures.

Test Your Thinking

1. Schoolwork as now graded is too hard for probably as high as 25 to 30 per cent of the pupils. In terms of mental health, what develops from this situation?

2. Just as schoolwork is too hard for the duller students, it is also too easy for the brightest ones. How is the personal adjustment of the latter affected by this situation?

3. Show how a regular and clean-cut system of work and play is conducive to good mental health.

4. Describe the characteristics of a wholesome and an unwholesome home, and show how they produce adjustment or maladjustment.

5. How can children learn in the school to deal with each other in a way that is typical of healthy, wholesome, personal adjustment?

6. What personal relationships between teacher and pupil are conducive to mental health?

7. Describe a teacher whom you think ideal in her influence on pupils in terms of their personal adjustment, and describe another teacher at the opposite extreme.

8. Jane is irritable. Her mother says that this is because she does not get the right foods and is tired. Comment.

9. "Oh, Clarence has an inferiority complex. We'll get him over that by a little readjusting." Comment.

10. "He's got brains, he is healthy, has a nice appearance, and has a good

family background. He has the makings for good personal adjustment."

Comment.

11. In dealing with problem children, discuss whether or not you think each child should be studied as a separate case.

12. Give the fundamental reasons why the characteristics listed in this chapter as serious are serious and why those listed as not serious are not so.

References

- AXELROD, P. L., M. S. CAMERON, and J. C. SOLOMON: An Experiment in Group Therapy with Shy Adolescent Girls, *American Journal of Orthopsychiatry*, **14**: 616-627, 1944.
- BAKER, H. J., and V. TRAPHAGEN: *The Diagnosis and Treatment of Behavior Problem Children*, The Macmillan Company, New York, 1935.
- BENTLEY, J. E.: *Problem Children*, W. W. Norton & Company, New York, 1936.
- BROWN, P. A.: Sex Differences in Introversion, *Journal of Social Psychology*, **12**: 399-404, 1940.
- BURNHAM, W. H.: *The Wholesome Personality*, D. Appleton-Century Company, Inc., New York, 1932.
- CATTS, NORMA E., and NICHOLAS MOSELEY: *Practical School Discipline and Mental Hygiene*, Houghton Mifflin Company, Boston, 1941.
- DYER, D. T.: Are Only Children Different? *Journal of Educational Psychology*, **36**: 297-302, 1945.
- GROVES, E. R., and PHYLLIS BLANCHARD: *Readings in Mental Hygiene*, Henry Holt and Company, Inc., New York, 1936.
- GUILFORD, J. P., and H. MARTIN: Age Differences and Sex Differences in Some Introvertive and Emotional Traits, *Journal of General Psychology*, **31**: 219-229, 1944.
- HATTWICK, BERTA WEISS, and MARGARET STOWELL: The Relation of Parental Over-attentiveness to Children's Work Habits and Social Adjustments in Kindergarten and the First Six Grades of School, *Journal of Educational Research*, **30**: 169-176, 1936.
- HOLLINGWORTH, L. S.: Intelligence as an Element in Personality, *Yearbook of the National Society for the Study of Education*, **39** (Part II): 291-275, 1940.
- HUNT, J. McV.: *Personality and the Behavior Disorders*, The Ronald Press Company, New York, 1944.
- MITCHELL, J. C.: A Study of Teachers' and Mental Hygienists' Ratings of Certain Behavior Problems of Children, *Journal of Educational Research*, **36**: 292-307, 1942.
- SANDIN, A. A.: Social and Emotional Adjustment of Regularly Promoted and Non-promoted Pupils, *Child Development Monograph* 32, 1944.
- SEARS, R. R.: Success and Failure, in Q. McNemar and M. A. Merrill, *Studies in Personality*, pp. 235-258, McGraw-Hill Book Company, Inc., New York, 1942.
- SELLING, L. S.: Malnutrition and the Problem Child, *New Child*, **3**: 187-194, 1944.

- SHAFFER, L. F.: *The Psychology of Adjustment*, Houghton Mifflin Company, Boston, 1936.
- SYMONDS, PERCIVAL: *Diagnosing Personality and Conduct*, D. Appleton-Century Company, Inc., New York, 1931.
- THOMPSON, C. E.: The Attitudes of Various Groups toward Behavior Problems of Children, *Journal of Abnormal and Social Psychology*, 35: 120-125, 1940.
- TORRANCE, P.: The Influence of the Broken Home on Adolescent Adjustment, *Journal of Educational Sociology*, 18: 359-364, 1945.
- WALLIN, J. E. W.: *Personality Maladjustments and Mental Hygiene*, McGraw-Hill Book Company, Inc., New York, 1935.
- WICKMAN, E. K.: *Children's Behavior and Teachers' Attitudes*, Commonwealth Fund, Division of Publication, New York, 1928.
- WITTY, PAUL A., and others: Mental Health in the Class Room, *Thirteenth Year Book, Department of Supervisors and Directors of Instruction, National Education Association*, Washington, D.C., 1940.
- WRIGHTSTONE, J. WAYNE: Evaluation of the Experiment with the Activity Program in the New York City Elementary Schools, *Journal of Educational Research*, 38: 252-257, 1944.
- YOUNG, K.: *Personality and Problems of Adjustment*, F. S. Crofts & Co., New York, 1940.

CHAPTER VII

THE MENTAL HYGIENE OF THE TEACHER

What to Look For. Note the proportion of teachers who are mentally ill and the proportion who need psychiatric treatment. Also note the proportion of teachers who have had nervous breakdowns and the proportion who have worries and tension so serious that their health is impaired. What proportion of long absences from school is caused by emotional and mental difficulties?

Be able to explain why a wholesome personality is so extremely important for a teacher to have. What is the relationship of teacher popularity to interest in school subjects?

Teachers should have about three fundamental qualities. Learn what they are. Also be able to describe the annoying habits of teachers.

For a number of reasons, which should be understood, the life of a teacher is often described as being difficult.

The teacher can have good mental health and can develop a wholesome personality. A number of helps are given.

Introduction. The children consistently disliked their sixth-grade teacher. She was severe and inflexible and rarely if ever smiled or laughed. The children were expected to behave like automata, and they were continually scolded and threatened with punishment. Both children and teacher were under constant strain and tension.

Miss F., the teacher, had few personal interests and fewer friends. People thought she was odd and never considered her as a person they would like to talk with. Miss F. was a chronic faultfinder. She was critical of everyone and everything and was never pleased or satisfied, it seemed.

If a psychologist had observed her, he would soon have learned that she was in poor mental health. In other words, she was maladjusted, did not have a healthy and healthful personality. Miss F.'s condition is not unique, for there are thousands of people who have unwholesome personalities.

Frequency of Mental Disorder. Teachers are no crazier than other people. In fact, the evidence indicates that there are fewer teachers proportionately, or in terms of their numbers, in hospitals for the insane than from the population as a whole.

But there are many teachers, and a distressingly large proportion, who have personalities that are a serious handicap in their work. These are the teachers who are so worried about so many things that they lose sleep, are so sensitive that they frequently get angry, are often sarcastic and unfriendly, and live isolated and narrow lives. Their personality weaknesses are not serious enough to warrant hospitalization, but still their effectiveness as teachers is impaired.

Dr. E. Altman, former chief medical examiner of the New York City schools, stirred up much discussion as well as the emotions of a considerable number of teachers when he said that of 37,000 teachers in the New York schools 4,500, or about 1 teacher in every 8, needed psychiatric treatment and that of the 4,500 a total of 1,500 were definitely mental cases. Other investigations substantiate these data and, in fact, indicate that Dr. Altman was probably conservative.

Dr. Altman tells us of teachers who were definitely psychopathic. One teacher said that it was freezing cold and sat in her room wearing her coat even though the temperature was 70 degrees. She said she smelled ether, and soon some of the children believed, too, that there was ether in the room. Another teacher told her pupils that everything in the room was charged with electricity. She threatened her pupils that if they did not behave she would pull a switch and electrocute them all. Another used a different method to discipline her pupils. She threatened to move the floor and ceiling together and thus crush them all to death. Another had poison gas on her mind. In this modern age some teacher with a distorted mind will probably take a little object out of her desk and threaten her pupils with an atomic bomb.

One teacher called in a policeman to complain about the electricity that jeopardized all in her classroom. In his own vocabulary he correctly diagnosed her condition by the ejaculation "Ah, nuts!"

It is a tragedy, of course, that people afflicted with distorted imaginations become morbidly unrealistic, but a greater tragedy is that teachers who are positively insane continue in the classroom year after year when they should be under the care of a doctor. However, we shall not dwell on the extreme cases but shall consider those teachers who have emotional difficulties serious enough to lessen their competence but not serious enough for isolation and treatment. The teachers we wish to discuss more fully are those with personalities that cause them to be thought of as difficult, odd, unsocial, or not quite normal.

Let us consider some more information about the mental hygiene of the teacher. Probably as high as 20 per cent of teachers, or 1 in 5, have a real need for improving their mental hygiene. Because of defi-

cient personalities, many teachers do not deal successfully with their pupils and with adults. They need stimulating experiences, which will improve their personalities and make them happier.

Information at hand is to the effect that 1 teacher in 10 has had a nervous breakdown. This means that 10 per cent of teachers have been ill for a long time, not because of infection or an accident, but because of failure, worry, stress, strain, or difficulties in getting along with others.

The National Educational Association has reported that 37.5 per cent of teachers have stated that they are so worried over various matters that their sleep, health, and efficiency are affected. This means that 3 out of 8 teachers have personal problems that seriously trouble them.

Closely related to this is the fact that about 30 per cent of teachers are emotionally and socially maladjusted. This is a little higher percentage than the 15 or 20 per cent who need an improvement in mental hygiene, but it is probable that the 30 per cent also experience much unhappiness and do not get along with people easily.

Teachers are absent from school because of illness, and far from all their absences are caused by pneumonia, heart trouble, colds, influenza, and other infections, and organic weaknesses. Between one-third and one-half of the teachers' long absences from school are caused by emotional and mental difficulties.

Data and information of the kind presented here are certain to arouse discussion. Some will probably contend that there is not that much maladjustment among teachers. Others may say that the situation possibly is even worse. All that need be stated at this point is that the data presented are taken from the most reliable sources we have and the likelihood is that they can be depended upon. The important fact to recognize is that the mental hygiene and personality of the teacher constitute an exceedingly important problem.

Why the Personality and Mental Hygiene of the Teacher Are So Important. Even though teachers have serious personality disorders to no greater extent than do adults in general, the problem is one of particular importance in the case of the teacher. For 6 to 7 hours each school day the teacher is closely associated with the students. The pupils look at the teacher for many minutes each day. They are affected by her taste in clothes, by the expression of her face, and by her mannerisms. The pupils hear for hours each day the voice of their teacher, which may be pleasing or strident. Teachers may be friendly or unfriendly, tolerant or overcritical, generous or severe, calm or nervous. These emotional and personal characteristics influence the

children. In fact, it is possible and even probable that some weaknesses and illnesses of personality are as contagious as are some physical diseases.

It has been mentioned that, in the schoolroom where a psychopathic teacher complained of the smell of ether, some of the pupils thought they smelled it also, although, of course, there was none to smell. The power of suggestion is very strong, as is the power of example. It is not difficult to understand how a neurotic teacher can induce fear, worry, distastes, insecurity, and nervousness in her pupils.

Teachers are continually in relationship with each other. They share offices and classrooms, plan together, and teach the same pupils. There is competition for professional standing, but also there is co-operation in carrying out the school program. There is opportunity for helpfulness or injury and for friendliness or antagonism. The quality of teacher relationships determines to a considerable extent the morale of the school. In general, the success of the school depends on the personalities of the teachers.

The personal relationships of teacher, supervisor, principal, and superintendent are also extremely important. Those in a supervisory capacity should be able to maintain pleasant relations with the teachers, and vice versa. Some teachers resent authority and guidance of any kind, and some in a supervisory capacity are very arbitrary and unsympathetic.

There probably is no situation in which wholesome personality is as important as it is in the school, with its continuous personal interchange. The teacher's personality is being tested in one way or another every moment of the school day.

In factory and on farm, personality is not thus on trial. It is important in every situation, but not so important for a worker tending a machine or a farmer plowing as for a teacher living with a roomful of pupils. A teacher during working hours is rarely alone. She is with pupils, fellow teachers, principal, supervisor, or parents. Occasionally a salesman adds to the surfeit of personal relationship.

One of the objectives of education is to instill in pupils a love for learning. A teacher strives to interest her pupils in the subject she teaches, and she hopes that they will acquire a lifelong interest in the subject matter to which she has introduced them. In this connection the personality of the teacher is fundamental, for a pupil's interest in a subject is determined largely by whether or not he likes the teacher. Pupils like a teacher on two grounds primarily. (1) They like the teacher who teaches well. (2) They like the teacher who is friendly and has a

pleasing personality. These two qualities, teaching ability and personality, go together more often than not.

It has been discovered that people who are asked to recall their school days and indicate which courses they liked and which they disliked base their preferences on which teachers knew their subject and were interesting and stimulating. It has also been found that college students seldom choose subjects which were taught them in high school by unpopular teachers but choose those which were taught by popular teachers. It is entirely reasonable that there is transference from good teaching to subject and that an effective teacher of good personality can condition her pupils to like the subject she is teaching.

In a certain college is a teacher who has been on the staff for a quarter of a century. During this time he has had many students, for his courses are required. The subject matter is intrinsically interesting, but he devotes most of his time to lecturing on everything but the subject. One student reported that it is doubtful that the instructor spends as much as 15 minutes a day on the subject and even these 15 minutes are wasted, so ineffective is the teaching. To make up for this, the teacher is fanatical on topics entirely irrelevant to the course; about these, he lashes himself into a frenzy.

Now the point is this: Of the hundreds of students he has had in class, not one who has gone on to graduate school has chosen to major in the field in which he taught. It is almost unbelievable that he could so completely kill the interest of his students in his subject, but he has done so.

The foregoing illustrates how a maladjusted teacher, one who may be considered to be slightly "off," can kill an interest in learning. Conversely, good teachers, those who know their subject and how to teach it and who have mature and friendly personalities, stimulate in many of their students a lifelong interest in their subjects.

THE CHARACTERISTICS OF GOOD TEACHERS

The teacher and prospective teacher should know the facts that have been presented about the prevalence and importance of neurosis and personal maladjustment among members of their profession. But it is even more important for them to know the facts that will help them to develop professional and social competence. It is not enough for a teacher to be professionally good; he must also be good socially. The two qualities, of course, are usually related.

We shall discuss (1) the characteristics of a good teacher and (2) what one can do to be as wholesome a person and teacher as possible. The

characteristics of a good teacher will be discussed from the standpoint of professional and personal qualities. It should be mentioned again that the professional and personal are closely related and that there are cause-and-effect relationships between them. This will be illustrated later.

Professional Qualities of a Good Teacher. Many inquiries have been made into the qualities of successful teachers. Students have been asked to tell what they like and dislike about their teachers. The following are some of the major characteristics of good teachers:

Knowledge of Subject Matter. The first requirement of a teacher is that he know his subject. Knowledge or ignorance of subject matter reflects itself in a teacher's personality and professional effectiveness more in college and high school than in kindergarten and the lower grades. At all levels, however, it is important that a teacher know his subject. In the lowest grades the teachers should at least have a sound body of knowledge about the child, his physiology and psychology, and should also know the theory and practice of teaching methods. Thus, at all levels, good scholarship is a first requirement.

One cannot teach what he does not know. Nor can he teach with enthusiasm unless he knows so much about his subject that he is interested in it and enthusiastic about what he knows. Ideas, facts, and inspiration flow from a mind that is full.

One of the worst effects of not knowing the subject is the influence of this deficiency on the personality of the teacher. As an illustration of this, a man who is a college teacher of English will be described. He had been a weak student in college, not once having earned an A or the highest mark in a single subject for a single semester. He attended different graduate schools and obtained the master's and finally the doctor's degree, but his marks barely satisfied the minimum requirements.

He had little interest in his subject and did little studying. His teaching was of a routine nature, and he wasted a good deal of time on this and that which had nothing to do with the subject. He was irritable, faultfinding, and a troublemaker. Not having succeeded himself, he was jealous of his fellow teachers who did well. He did not have the capacity for what he was doing, and he reacted unhappily. Because of his emotional experiences, he developed ulcers of the stomach—a development that suggests the psychosomatic, or mind-and-body, relationship.

Here, then, is an example that is typical of some teachers at all grades and levels. First there was lack of capacity, then lack of subject

matter, followed by lack of success, with the accompanying development of poor personal qualities.

Capacity and Willingness to Teach Effectively. It is not enough to know the subject—many teachers know their subject but do not know how to teach. To be successful a teacher must also be able “to put the subject across,” as the students say. He must know how to teach and must do it enthusiastically.

Teaching ability depends on a large number of factors but primarily on scholarship, or knowing the subject, on good personal qualities, and on the possession of teaching skills and a good educational philosophy.

Students prefer teachers who explain the lessons clearly and make the assignments thoroughly understood. They want a teacher to be willing to help them with their schoolwork and to do so when necessary.

Teachers who can make class lessons interesting and lively are liked by students, and most students enjoy the use of examples and vivid illustrations. Pupils do not like dull and boring class periods. A teacher should be able to command the attention of his pupils and also make it much worth their time to listen.

The Personal Qualities a Teacher Should Have. Whatever constitutes a good personality is what the teacher should have, and it is what the best teachers do have. Everyone wants a good personality because it brings pleasantness and happiness. Thus the personal qualities a teacher should possess are those which a lawyer, doctor, pastor, clerk, or mechanic should possess also. Everyone tries to acquire the ability to maintain natural and pleasant person-to-person relationships.

But there are certain specific qualities that pupils want their teachers to possess. In this connection, a long list of good personal traits could be given, but little that is helpful would be thus gained. Let us consider instead the qualities that students like in their teachers, the characteristics of the best and poorest teachers.

The best teachers, those whom students like, are cordial, friendly, good-natured persons. Students prefer a teacher who has a good sense of humor, who enjoys a good joke, and who is glad when people laugh and are happy. A teacher who is patient, kind, sympathetic, and fair has the students on his side. In short, the best teacher is wholesomely extroverted and takes a genuine personal interest in the student.

It is apparent that a teacher who exemplifies these qualities is likely to be in good mental health and to continue to be so. It is conceivable that a teacher who lacked these qualities but who tried to acquire them would become a happier and more wholesome person.

If a teacher wishes to make himself unhappy, disliked by his students, and in general unsuccessful, he should be sarcastic and cross and frequently become angry. He should be impolite, should nag his pupils, should have "pets," and should be aloof and overbearing. In general, he should be an unhappy grouch who has no interest in his students' feelings or welfare.

ANNOYING HABITS IN TEACHERS

Any peculiarity or annoying habit in a teacher may react unfavorably on him. Both pupils and fellow teachers are affected unpleasantly by mannerisms or habits that are more or less irritating.

Moore learned from students that they dislike in their teachers certain mannerisms such as pacing the floor, fiddling with watch chain and keys, staring out of the window, and putting the feet on the desk. Apparently students want their teachers to concentrate on their work in a dignified manner without any show of physical nervousness. In this category is scratching the head and fussing with the hair. Pupils like their teachers neatly groomed, and they react negatively to slovenliness.

Pupils dislike having their teachers employ their pet catchwords, their favorite expressions, over and over again. It displeases them to hear their teachers dwell on their personal affairs or to stray off the subject and talk of this and that of an irrelevant nature. Pupils like a good sense of humor, but not old, stale jokes. Sometimes a teacher uses certain jokes with such regularity that the classes learn when they are due; when that situation develops, the teacher becomes the joke.

The teacher's voice, which sounds in the classroom much of the time, should be pleasing. Monotonous or shrill voices, those which are too loud or too low, constant clearing of the throat, "ahing" and "aheming"—all these irritate students.

CONDITIONS THAT TEND TO BREAK DOWN THE TEACHER

Certain writers, usually educators, emphasize the conditions that tend to make the life of the teacher a hard one. They point out that there are special circumstances that induce neurosis and personal maladjustment. To believe some of these writers is to believe that society has conspired against the teacher and imposed conditions upon him that will inevitably make him unhappy and distort his personality.

One of the yokes usually first mentioned is the restrictions that communities impose on their teachers. Teachers are looked on as being examples for the young and are expected to be paragons of ascetic living. Some communities frown on teachers who dance and play

cards. Teachers are expected to buy their clothes and supplies in the community in which they work. Week-end absences are discouraged. Attendance at church is taken for granted. In addition, teachers are often urged to teach Sunday school.

Few schools appoint married women as teachers. In many schools, when a woman teacher marries, she loses her position. The premarital and romantic interests and activities of teachers are subjected to the community's severest scrutiny.

Yet the community regards teachers as strangers and transients, not an integral part of the community, and they are thus not held in the esteem they deserve. A feeling of belonging is not developed, and consequently they feel socially insecure.

All this has a repressing effect. The public attitudes described cause teachers to live such narrow and unnatural lives that their personalities are blighted and neurosis is induced.

Working conditions, too, maladjust the teacher, who is overworked, underpaid, insecure, oversupervised, autocratically controlled, under a low ceiling of fear, and hopelessly entangled in minutiae, trivia, and meaningless detail.

The work of the teacher, it is pointed out, is one of great strain, children, principal, supervisor, superintendent, and parents contributing to this situation. Her salary is not large enough to enable her to maintain the social and professional status that her position demands. There is the constant danger that she will lose her position, and she feels insecure. Dealing with the immature minds and the unsocial behavior of her pupils depresses her, both mentally and emotionally. There are so many things she has to do in the school that she is in a state of turmoil and confusion.

This extreme point of view represents the attitude of defeatism and reflects incompetence or the inability to cope with a situation. Let us consider what teachers should do to be successful in their work and to develop and maintain a wholesome personality and good mental health.

GOOD MENTAL HEALTH AND A WHOLESOME PERSONALITY FOR THE TEACHER

Develop a Wholesome Attitude. First the teacher must assume an attitude of individual responsibility. He must regard himself as responsible for his own well-being and not blame his salary, the community, his supervisors, or the school. To a very great extent a person is responsible for making his own way; if his salary is too small, he is free to try to earn more elsewhere. If the community is not friendly,

possibly this is because he is not friendly. If he does not get along successfully in the school, perhaps this is more than 50 per cent his own fault.

The tendency of teachers to blame everything but themselves is the worst kind of rationalization—projection, more specifically. One is more likely to develop a better personality if he is governed by the belief that within reasonable limits he gets what he earns. Any teacher who serves the students well will have them singing his praises at home and throughout the community, and it will not be long before he has a very high standing and all the prestige he cares for. A teacher who is efficient and competent will accomplish his work without much difficulty and will not feel that the duties are too great a burden.

If teachers are to achieve good mental-hygiene status, they must first of all avoid the attitude that "everything else is to blame." Rather, they must assume the responsibility themselves for whatever their individual or collective situation may be.

Achieve Competence. There is nothing that keeps one as sound and healthy as success. The person who is successful, who does his job well, is stimulated by happy and satisfying experiences that keep his personality wholesome.

A competent person lives in the healthful warmth of achievement, and in order to have good mental health a person must feel that he is achieving. One who cannot cope successfully with his work and drags himself through it day after day with a feeling of failure or inferiority soon develops compensations for his weaknesses and consequently an unwholesome personality.

Symonds, in studying the needs of teachers, found the need for achievement the most marked. Closely related to this was a desire for recognition and for friends. If a teacher or anyone else, for that matter, is stimulated by achievement, he is certain to obtain more recognition and is more likely to have friends. Everyone wants a feeling of personal worth, which is obtained in large measure through achievement.

In order to achieve competence and be a successful teacher, one should follow these procedures:

1. Keep studying the subjects he teaches. On graduating from college the teacher has just begun to master his subject matter. Year after year he should study books and magazines in his field and related fields and continuously introduce the new material into his classes.

2. Keep studying professional books and magazines that develop ideas about teaching. Some teachers scorn books on psychology, philosophy, and methods, but this reflects a serious weakness. What

would anyone think of a salesman, musician, storekeeper, or manufacturer who poked fun at newer and better methods of doing his work?

Combine continuous professional study with an experimental attitude. Knowledge about pupils and how to teach them should be supplemented by trying out new ideas. The teacher should avoid the rut of routine by teaching in different ways. He will find certain methods more suited to him than others, but he should be flexible in the use of the methods he finds best.

3. Develop a good personality. Competence in itself is an important factor in developing a good personality, and in turn personality is an essential element in competence. There is a mutual cause-and-effect relationship between personality and competence.

Many books on personality development are available. The teacher should be familiar with their content. The knowledge so acquired may prove useful; but, in order to be effective, knowledge must be translated into behavior.

The teacher can do much to develop a good personality by cultivating the attitude that schools exist for the students and by trying always to be helpful to the students and to his fellow teachers. If he submerges himself in the service of his students and his colleagues, he will soon learn the truth of the words that the way to find oneself is to lose oneself.

Have a Social and Recreational Program. Studies have shown that well-adjusted teachers have more hobbies and out-of-school activities than the poorly adjusted. Phillips and Greene discovered that about four times as many well-adjusted teachers were engaged in outdoor sports and were active socially as were teachers with neurotic symptoms. On the other hand, neurotic teachers in the ratio 6 to 1 spent their "recreational" time in activities that resembled their teaching activities.

No one can be sure of the cause-and-effect relationships of personal hobbies and mental health, but it seems clear that it is wholesome for teachers to mingle with other people and be physically and socially active. Games, hunting, fishing, camping, hiking, and dancing are healthful activities. If one lives a sedentary life and is a social isolate, the likelihood is that one's mental health is not good.

Thus the teacher must be sure to reserve some time for outdoor and social activities. A person must have some fun if he is to be healthy. A little vacation should be taken every week. Annual vacations that take one into a new environment with its different personalities and interests are a requirement for good living.

Keep Out of Debt. It is true that teachers' salaries are not large, but to spend more than is received will not help matters. Hardly anything can harass and undermine one as chronic debts do. There are times when one should "take a chance" on going into debt, as in the case of a young person, for example, borrowing to continue his education and consequently increase his earning power. But ordinarily one should avoid debt as one does imprisonment.

No one is free when he is under obligation to relentless debtors. Worst of all is the situation that develops when resort has been made to the loan sharks, those who send out the sweet-worded folders about how easy it is to borrow for vacations or any other personal needs but who charge interest rates over 30 per cent. Many teachers allow themselves to be made unhappy victims of these moneylending sharks. One should not add to his personal problems by getting into financial trouble. The number of teachers who have let their financial situation depress them is surprisingly large. The number of teachers troubled by badly managed financial affairs is very discouraging. Much stress and strain can be avoided by waiting to have the cash in hand when purchases are made rather than buying on credit.

Secure Good Living Quarters. If at all possible, a teacher should have pleasant living quarters and a provision for good meals. If one is not happily situated in this respect, it is almost impossible to maintain mental health. The teacher needs privacy, and his living quarters should provide it. Many communities afford only inadequate living accommodations to their teachers. One of the first questions that teachers ask each other is, "Have you a good place to room and board?"

Other Factors for Achieving Personal Adjustment. Other procedures to follow in order to achieve and maintain mental health are briefly listed below:

1. Keep physically fit. Many of the points already mentioned contribute to general health, but in addition one should have a medical examination frequently enough to check any unfavorable developments.

2. Maintain a good personal appearance. Good grooming contributes to personal morale, for one feels more worth while when he looks his best. A trim, neat appearance helps morale. The girl who said, "When I feel a little depressed, I spruce up and walk down the avenue" was practicing good psychology. The reference to good clothes as "glad rags" has a true psychological connotation.

3. If in need of special aid, consult a professional counselor. The advice of good friends often helps, and the family doctor frequently can solve many personal problems.

Do Not Be a Neurotic Perfectionist. There are teachers who insist that everything must be done "just so," who are overfastidious and very formal, who try to compress every pupil into the rigid form that they select, who demand that their pupils sit, pass, and do their work exactly to their dictates. Such teachers are neurotic perfectionists.

We can illustrate this by the case of a second-grade teacher who was a perfectionist and worked endlessly over the details of her teaching. She spent long hours, after school and during the week ends, getting busy-work ready and going over and over lesson plans and the written work of her students.

Not much was accomplished, for she saw only the trees and not the woods. She was drowned in detail and entangled in the meshes of minutiae. All the pupils' work down to the smallest detail had to be executed according to precise forms. There was a littleness and constriction about her work, instead of imagination and expansiveness.

This teacher had very little social life. She rarely left the area marked by her classroom, her apartment, and the route she walked between these two points. She said she was glad when she could close the door of her apartment and be alone.

Here was a teacher so involved in her narrow perfectionism that she lived a very restricted and unimaginative life. She was hard on the personalities of her students, and in turn the atmosphere thus created was hard on her. She was rigid, unrelaxed, and inflexible, but she carried on in the belief that she was teaching well.

A teacher should be earnest and conscientious and should do her best, but she should not be overcritical. She need not demand that every *t* be crossed and every *i* be dotted at all costs. She should regard details and form as means and not the end. She should not be so fascinated by the small wheels and gears of the educational machine that she overlooks the purpose of education, which is the culture and development of the student.

Make the Best Adjustment Possible. The conditions surrounding an individual, and the individual himself, are responsible for his mental health. The teacher should try to ensure as good conditions for herself as possible. One step she should take is to join a local, a state, and a national teachers' organization. Just belonging has a good effect. Moreover, through such organizations, teachers can work for tenure, better working conditions, and higher income. Teachers should try

to improve their profession or craft, just as doctors, lawyers, engineers, musicians, miners, carpenters, and other working groups do.

As an individual, the teacher has a rich opportunity for happy relationships with her pupils and fellow teachers. No one has as great a chance for personal rewards as the teacher. Pupils wish to be on good terms with their teachers and are very appreciative of what they do for them. Parents, too, value the teachers who earn the respect and appreciation of their children.

Within the profession itself, teachers have opportunity for companionship with their colleagues. Such a fellowship can be very rewarding.

All in all, the teacher is in a position particularly favorable for developing a feeling of self-esteem and personal worth. Her situation in the midst of pupils, parents, and fellow teachers is especially conducive to being respected and appreciated. She is working in the midst of a human gold mine, and the personal wealth is there for those who will earn it.

SUMMARY AND REVIEW

Possibly 4 or 5 per cent of the older, more experienced teachers are actual mental cases, and at least 10 per cent need some psychiatric help. One teacher in 10 has had a nervous breakdown, 37.5 per cent have serious troubles that affect their sleep and health, and nearly half of the teachers' long absences from school are caused by problems of mental hygiene.

The personality of the teacher is especially important. The teacher while in school is in almost constant association with pupils and colleagues, and her personality is always in action, so to speak. Pupils learn to become interested in subjects or develop a love of learning largely in terms of the teacher's personality.

In order to be most successful, a teacher must know the subject matter, must know how to teach it, and must have a good personality. Students regard as having a good personality the teacher who is patient, kind, sympathetic, fair, and friendly and who has a sense of humor.

Some habits in teachers that annoy pupils are straying from the subject, using favorite catchwords and well-worn jokes, pacing the floor, staring out of the window, and using the voice poorly—in short, not concentrating effectively on the teaching to be done.

Conditions that make life hard for the teacher are low salaries, an unsympathetic public, artificial standards of behavior, overwork, supervision, fear of dismissal, and the burdens of endless detail.

Too much concentration on such conditions is rationalization, how-

ever. The teacher can maintain or achieve mental health by feeling responsible for her own welfare, by being competent through sustained study and thoughtful experimentation, by having social and recreational experiences, by keeping out of debt, by securing comfortable living quarters, by maintaining her physical health, and by not being a perfectionist.

Test Your Thinking

1. Does the number of teachers estimated as mental cases correspond to the experience that about 1 person in 20 will at some time be seriously ill mentally?
2. List the data which indicate that teachers have serious problems of personal adjustment.
3. Discuss the importance of the personality of the teacher from the point of view of the pupil's personality and his love for learning.
4. Show that the professional qualities of a teacher may influence his personality.
5. How do the personal qualities which a teacher should have differ from those which a doctor, lawyer, clerk, or policeman should have?
6. List annoying habits in some of your former teachers.
7. Discuss whether or not you think that the life of the teacher is a hard one.
8. Interpreted in terms of our basic motives and wants, what can the teacher do to achieve good mental hygiene and personal adjustment?
9. Do you believe that the individual teacher has to assume most of the responsibility for her own adjustment? Comment.
10. Why does blaming everything or everyone but oneself probably increase teacher problems rather than diminish them?

References

- ALILUNOS, L. J.: Needed Research in Teacher Mental Hygiene, *Journal of Educational Research*, **38**: 653-665, 1945.
- ALTMAN, E.: Mentally Unbalanced Teachers, *American Mercury*, **52**: 391-401, 1941.
- BOYNTON, P. L.: An Analysis of the Responses of Woman Teachers on a Personality Inventory, *Peabody Journal of Education*, **20**: 13-19, 1942.
- BRYAN, R. C.: Opinions of Teachers Held by Former Pupils, *School Review*, **51**: 555-561, 1943.
- CAVANAUGH, J. O.: The Relation of Recreation to Personality Adjustment, *Journal of Social Psychology*, **15**: 63-74, 1942.
- COREY, STEPHEN M., and GEORGE S. BEERY: The Effect of Teacher Popularity upon Attitude toward School Subjects, *Journal of Educational Psychology*, **29**: 665-670, 1938.
- DAVIS, R. A.: The Teaching Problems of 1075 Public School Teachers, *Journal of Experimental Education*, **9**: 41-60, 1940.

- DODGE, A. F.: What Are the Personality Traits of the Successful Teacher? *Journal of Applied Psychology*, 27: 325-337, 1943.
- FERGUSON, HAROLD, and HERMAN O. HOVDE: Improving Teaching Personality by Pupil Rating, *School Review*, 50: 439-443, 1942.
- GOULD, A.: The Mental and Physical Health of Teachers, *School and Society*, 53: 706-711, 1941.
- HAGGARD, W. W.: Some Freshmen Describe the Desirable College Teacher, *School and Society*, 58: 238-240, 1943.
- MOORE, J. E.: Annoying Habits of High School Teachers, *Peabody Journal of Education*, 18: 161-165, 1940.
- PHILLIPS, WENDELL S., and JAMES E. GREENE: A Preliminary Study of the Relationship of Age, Hobbies, and Civil Status to Neuroticism among Women Teachers, *Journal of Educational Psychology*, 30: 440-444, 1939.
- RETAN, G. A.: Emotional Instability and Teaching Success, *Journal of Educational Research*, 37: 135-141, 1943.
- SMITH, A. A.: What Is Good College Teaching? *Journal of Higher Education*, 15: 216-218, 1944.
- SYMONDS, P. M.: Suggestions for the Adjustment of Teachers, *Teachers College Records*, 44: 417-432, 1943.
- SYMONDS, P. M.: The Needs of Teachers as Shown in Autobiographies, *Journal of Educational Research*, 36: 662-677, 1943.
- UHRBROCK, R. S.: College Courses in Retrospect, *Journal of Higher Education*, 15: 431-437, 1944.
- YOUNG, FRANK: Some Factors Affecting Teaching Efficiency, *Journal of Educational Research*, 32: 649-652, 1939.

CHAPTER VIII

MEASURING THE CAPACITY FOR LEARNING

THE GENERAL INTELLIGENCE OR MENTAL TEST

What to Look For. The discussion in this chapter begins by pointing out differences in the learning capacities of children and then centers on the beginnings of attempts to measure their mental capacities. Both the individual and the group intelligence, or aptitude, test are described.

Learn about the beginnings of mental tests by Binet and Simon and also by Cattell.

Why were the tests by Binet and Simon successful intelligence tests whereas those of Cattell were not?

Two revisions of the Binet scale, the 1916 and the 1937, known as the Stanford Binet, are mentioned, and the 1937 revision is explained in considerable detail. Learn about the nature and characteristics of the latter test.

Learn clearly the meaning of intelligence quotient and mental age, and be able to calculate the mental age and intelligence quotient according to the method presented in this chapter.

The group test is also described, including a brief history and the nature of its contents. Be able to describe the various types of items in the group test, and indicate the various mental processes, such as reasoning and memory, that are tested by these items.

Learn how norms and standards for a group mental test are determined and also how the I.Q. is calculated.

Introduction. In 1918, about three decades ago, there were in a Minnesota rural school 2 pupils who stood out by contrast among the 33 who constituted the total enrollment. Anna was six years old, an industrious little pupil who sat in the left outside row, the row for the first-graders. Paul was a tall adolescent boy of fourteen who occupied a desk in the other outside row. Paul was only a fourth-grader, but he sat in the eighth-grade row because the seats were larger. To that extent, at least, an adjustment had been made for him. The teacher could readily see that Paul was a big boy and that he needed a larger seat than the other fourth-graders.

The teacher, however, could not see so definitely the degree of Paul's mental capacity. She knew that he had not been a bright stu-

dent, for he had spent 8 years in school and was still only in the fourth grade. Furthermore, in spite of his age, he was a poor fourth-grader.

Anna, on the other hand, was an excellent pupil. She could do a little arithmetic and read aloud unfalteringly. She grasped meanings well and could explain what she had read. Her parents were aware of her school achievements and felt that she was being well taught.

Paul, unlike Anna, read haltingly. As he read, he jerked and awkwardly bowed his head to many words, and appropriately enough, for they were his master. He knew little of what he read and was unhappy when he struggled with the words. His teacher made him try hard and was often impatient. She hoped the time would come when Paul would "wake up" and learn as easily as the other pupils did. Because Paul learned little, his parents thought that he was poorly taught.

If at that time mental tests had been available, and the teacher had acquired the technique of administering them, she might have learned something about her pupils that would have enabled her to treat them more realistically. She would have discovered Anna's mental status in terms of average children of her age and thus understood why Anna was proficient and how rapidly she could be expected to learn. Paul's capacity to learn could also have been determined, and the educational process could have been adapted to him almost as effectively as the seating adjustment. Thus adjustment could have been made to his mental as well as to his physical size.

The Introduction of Mental Tests. Differences in the capacities of pupils and problems arising from these differences have always confronted the teacher. Psychologists and educators recognized the need of an accurate test; and since late in the nineteenth century, attempts have been made to formulate one for measuring intelligence. Tests of mental capacity were being composed and revised at the turn and beginning of the century. There were no tests that could be given to a group of children simultaneously, but a mental test had been devised for testing one child at a time. A test that can be administered to a group is called a *group test*; a test that can be given to only one person at a time is called an *individual test*.

The Development of Mental Examinations. The first successful examination of mental capacity was devised by Alfred Binet, a Frenchman. He was asked by the school authorities of Paris to work out a method for identifying the dull pupils. The schools were troubled by the retarded children and wanted a system of judging their capacities for doing schoolwork. It should be noted that the tests arose from problems connected with the ability of children to do schoolwork and

that it was the retarded children who provoked the inquiry for a measuring instrument.

Binet, with the help of his colleague Simon, worked for over a decade at this problem. In 1905 the two collaborators published their examination, which consisted of 30 separate tests or items. Binet continued to rework and revise this test until his death in 1911. A revision of his scale had been brought forth in 1908, and another in 1911, the year of his death. This last revision included more tests and could be used for testing subjects ranging in age from three years to adulthood.

The present form of intelligence tests is essentially a product of the beginning of this century. The Binet-Simon scale of intelligence was introduced to the United States by Goddard, who translated and adopted the tests for use at the institution for the feeble-minded at Vineland, N. J. Here, again, the test was first used on the retarded, a fact that may account for some of the prejudice against mental examinations in general. The form of test most extensively used in the United States is the Stanford Revision and Extension of the Binet-Simon Scale, which was published in 1916 by Lewis M. Terman of Stanford University. In 1937, another revision by Terman and Merrill was published. Before analyzing this more recent revision, we should consider some of the attempts of the last century to measure intelligence. A knowledge of those attempts and failures will help us understand what capacities the present-day tests measure.

The publication of the original Binet-Simon scale in 1905 was not the first attempt to measure intelligence or the capacity to learn. There had been those before Binet and Simon who had tried but not successfully. Success in any endeavor always has its antecedents in the attempts of others. Almost every important inventor, discoverer, or creator is preceded by a number of other men who tried to accomplish that which was finally invented, discovered, or created. Similarly in the case of Binet and Simon.

Among earlier investigators was James McKeen Cattell, a distinguished American psychologist of the late nineteenth and early twentieth centuries. Cattell in the 1890's developed a series by means of which he hoped to test mental capacity. Included in his series were tests of quickness in naming 10 colors, of strength of grip, of ability to bisect a 50-centimeter line, and of speed of arm movement. These exercises tested sensorimotor abilities but failed to measure mental capacity. Cattell discovered that there was no relationship between the abilities of college students in these tests and their academic suc-

cess in college. He assumed that ability in school is a general indication of mental ability and concluded that because the ability measured by these tests did not correlate with school ability these tests did not measure intelligence.

It remained for Binet to develop a scale that was actually a mental test. He set out to test the complex mental powers and not the sensorimotor abilities, as others had done, particularly in the newly established psychology laboratories of that time. Binet devised problems and exercises to test comprehension, memory, power of making comparisons, ability to draw conclusions, reasoning, and other mental processes.

The Age Scale. Not only did Binet find exercises for measuring mental capacity, but he also arranged his tests in a scale of age levels. The difficulty of the individual tests was determined by the percentages of children of given ages who passed a test. Tests passed by 75 per cent of six-year-olds were placed at the six-year level, and comparably for the other age levels.¹ The principle of the age scale as formulated is like that used by Terman and Merrill in their latest revision. Therefore the study of the Terman-Merrill test in some detail will provide a clear understanding of the individual age scales in general as well as of the last Terman revision.

THE REVISED STANFORD BINET TESTS OF INTELLIGENCE

The first Stanford Binet scale, which was a revision by Terman and assistants of the original Binet scale, was published in 1916. This revision had been used extensively for a little over 20 years, and in 1937 the new revised Stanford Binet tests were issued by Terman and Merrill. These appear to be a considerable improvement over the 1916 revision. There are two forms or examinations—Form L and Form M—in the 1937 revision and but one form in the 1916 revision. Thus there are two examinations where there was only one before, so that when a person is retested he can be tested with a different form, and thus the practice effects that accompany the repetition of the same examination can be avoided to some extent.

The test has also been lengthened so that it extends from year level II up through superior adult. Because a test must extend below the age level of the average child being tested, it may be said to be satisfactory on the average for persons ranging from age three up through adulthood. For dull children, the test is not so suitable for those as young as three, but it is quite satisfactory for those four, five, or six

¹ The percentage of successes for each age group, however, was not always 75 per cent.

years of age, depending on the degree of dullness. Bright children a little younger than three may be tested by the 1937 revision.

Table 3 gives a skeleton outline of Forms L and M, showing age level, the number of tests at each age level, and the value of each test. In the lower age levels, from year II to V, there is an extra test, so to speak, which is called an *alternate*. It is used when a test is spoiled or cannot be used for other reasons, as sometimes is the case with younger children. According to this outline, the maximum mental age that can be tested is 22 years 10 months. The number of tests, alternates, and values is the same for both forms.

In order to test a person adequately, it is necessary to find a year level in the examination where he can pass all the tests. For an average child, this level is usually 1 or 2 years below the age of the child. Thus, an average three-year-old child will probably pass all the six tests of year level II. A dull three-year-old is not likely to do so; and a very dull one is certain not to succeed with all the tests. On the other hand, a bright three-year-old can probably do all the tests at the three-year-old level and, if exceptionally bright, can do those even at a higher age level.

TABLE 3. YEAR LEVEL, NUMBER OF TESTS, AND VALUE*

Year	Number of tests for both Form L and Form M	Value of each test, months
II.....	6	1
II-6.....	6	1
III.....	6	1
III-6.....	6	1
IV.....	6	1
IV-6.....	6	1
V.....	6	1
VI.....	6	2
VII.....	6	2
VIII.....	6	2
IX.....	6	2
X.....	6	2
XI.....	6	2
XII.....	6	2
XIII.....	6	2
XIV.....	6	2
Average adult.....	8	2
Superior adult I.....	6	4
Superior adult II.....	6	5
Superior adult III.....	6	6

* 22 years 10 months if all tests are passed.

Basal Age and the Calculation of I.Q. The basal age has been discussed incidentally but has not been named. It consists of the highest year level at which a pupil can pass all the tests. In the case of a child who passes all of year II but not all of year II-6, the basal age is II. For purposes of this example, assume that this child who is three years, or thirty-six months, old passes all six tests of year II, five tests of year II-6, three of year III, two of year III-6, one of year IV, and none of year IV-6. The problem consists in finding first this child's mental age and then his I.Q. The following outline of values can be derived by interpreting the data given in terms of the values listed in Table 3.

To find the intelligence quotient, divide the mental age by the chronological age, or 35 by 36. The resulting .97 indicates an I.Q. that is about average. I.Q.'s are average when the M.A. and the C.A. are equal or nearly so. The M.A. is equivalent to the total value of

Year	Number of tests passed	M.A. value of each test, months	M.A. value of tests passed, months	Cumulative M.A. value,* months
II	6	1	6	24
II-6	5	1	5	29
III	3	1	3	32
III-6	2	1	2	34
IV	1	1	1	35
IV-6	0	1	0	35

* The total M.A. of this child is 35 months.

the tests passed. Each test is given a value in months according to the number at each age level and the value of each level. Some levels, such as the lower ones, II to V, count 6 months each; years VI to XIV

Year	Number of tests passed	M.A. value of each test, months	M.A. value of tests passed, months	Cumulative M.A. value, months
XI.....	6	2	12	132
XII.....	5	2	10	142
XIII.....	5	2	10	152
XIV.....	3	2	6	158
Average adult	2	2	4	162
Superior adult I.....	2	4	8	170
Superior adult II.....	1	5	5	175
Superior adult III.....	0	6	0	175

count 12 months each; and the adult levels count 16, 24, 30, and 36 months, respectively.

Consider the boy twelve years two months old who passes all the tests of year XI, five of year XII, five of year XIII, three of year XIV, two of average adult, two of superior adult I, one of superior adult II, and none of superior adult III. His mental age can be obtained by outlining his performance as was done for the other case.

The basal year is XI, or 132 months, and therefore the values for the tests passed in the other years are added to this value. The total M.A. of this boy is 175 months, and his C.A. is 12 years 2 months, or 146 months. His mental development is equal, on the average, to that of children 175 months old, and it exceeds his age. Therefore his I.Q. is over average. It is obtained by dividing 175 by 146, and the resulting quotient of 1.20 is expressed as an I.Q. of 120 by dropping the decimal point.

The Nature of the Tests. The character of tests varies somewhat throughout the scale from the lowest age level through superior adult. At the lowest age levels the verbal nature of the test is minimized by the greater use of objects than at the upper level. At the two-year level, for example, the child is asked to identify a toy kitten, a thimble, a cup, a spoon, a chair, an automobile, a key, and a fork. The use of object material, such as beads, blocks, and other things usually regarded as toys, is obviously more appropriate for young two- and three-year-old children than for adolescents or adults. At the upper age levels the intelligence is measured more by verbal and abstract tests than by concrete or object material.

Even though there is a variation throughout the age levels to the extent that the tests are concrete or abstract, there is a similarity that runs throughout the various age levels also. An example of this similarity is found in the exercises calling for the repetition of digits after the examiner has spoken them. For example, the examiner will speak at a rate of about 1 a second the digits 4, 9, 2, 6 and then ask the subject to repeat them. At the year level of 2 years 6 months the subject is asked to repeat 2 digits; and at the highest superior-adult level he is asked to repeat 9 digits. Between these extremes, the tests calling for the repetition of digits occur at several age levels. At a few levels the subjects are asked to repeat them backward.

Another type of question that appears at several age levels is one in which the subject is asked to respond to pictures by telling the examiner about them. At the lower levels the subject passes the test if he merely enumerates the objects or persons in the picture. At the

level above enumeration, he must describe a picture; and the highest level calls for interpretation. In order to classify as interpretation, the answer must consist of implication and seeing behind the picture, so to speak. In a picture of old men outside a post office surrounding a man reading a newspaper, enumeration would consist in saying men, paper, building, etc.; description consists in saying that the men are together outside the post office looking at the newspaper; whereas interpretation would consist in saying, "One man has a newspaper that contains very important news, possibly about an election or a war, and he is reading to his friends who have no newspaper; this picture is of a time long ago when there were few newspapers."

In addition, there are pictures in which the subjects are asked to fill in missing parts; to compare pictures of faces and indicate the prettier ones; and to locate the absurdities in pictures, such as the shadow falling toward the sun or the smoke going in one direction and the trees bending in another. Picture tests of this kind vary in difficulty and are placed at age levels according to their difficulty.

Tests of word meaning occur at a number of age levels also. At the five-year level a child is asked to define simple words like *ball* and *bat*; but at the upper age level the meanings of difficult abstract words are asked for. In fact, in one of the forms of the 1937 revision, there is a vocabulary test consisting of a list of 45 words ranging from the very easy to the very difficult. This vocabulary test, therefore, can be used over a wide age range to discover how many words the subject knows. There are also tests calling for similarities and differences in the meaning of words.

Besides the repetition-of-digits test, memory is also tested by reading a section of a story to the subject and noting how much he can recall, by reading sentences of different lengths and asking the subject to repeat them, and by copying a pattern of different-shaped beads that has been shown. Thus, both auditory and visual memory are tested.

There are other kinds of individual test in the Terman and Merrill 1937 Stanford Binet revision, for example, arithmetic problems, questions on what to do under different circumstances, as when thirsty or in danger of being late for school; interpretation of such absurdities as a soldier saying that everyone is out of step but himself; and proverbs such as "The mouse that has but one hole is easily taken."

Not all the mental tests have been described, but this brief description gives a fairly adequate picture of the general nature of a widely used individual examination in which the various tests are

classified into age levels. The nature of the particular tests in the scale indicates that they test various types of memory, power to comprehend and reason, ability to make associations, and also the extent of knowledge of various kinds.

GROUP TESTS

Psychologists also sought to develop examinations that would test the mental capacity of a group of persons at one sitting. The individual examination is a satisfactory test of mental capacity, but it usually takes more than an hour to test a child, score his answers, and determine his level of mental development. It was therefore natural to seek a test that could be given to the members of a group all at one time.

About 1915 a number of American psychologists were working on group tests. The entrance of the United States into the First World War caused them to utilize these early efforts in preparing a group intelligence test known as the *Army Alpha*, for discovering the mental abilities of conscripted soldiers. Results stimulated the construction of other tests, so that within a few years after the close of the war many group tests for children and youths had been constructed. Now we have so many mental tests that hardly anyone is familiar with them all. The most flourishing period for their construction and use was the decade 1920–1929. It was during that decade also that the psychological and educational journals contained the greatest number of articles based on findings obtained from the use of these tests. Although intelligence tests are still used extensively and probably more discriminatingly than ever before, the amount of research based on them has declined considerably. A type of research now in progress is that involving mental examinations given the same subjects several times throughout a comparatively long period of years. Now that psychological examinations have been in use over two decades such research yields valuable data.

The Exercises in the Group Intelligence Tests. There are different kinds of exercises in the intelligence tests. To some extent, they all test mental abilities, but the virtue in having a variety of tests is that a wider range of mental abilities is more thoroughly tested. Accordingly, one is likely to obtain a more adequate measurement of general mental ability with a variety of tests than with only one.

Group mental tests include exercises for testing the following: knowledge of words, or extent of vocabulary; reading ability; ability to solve arithmetical problems; ability to complete sentences; general information; capacity for logical relationships; judgment; common sense; etc.

Most of the items are verbal in nature, although other kinds are used, such as figures and pictures. The following specimens will illustrate the various kinds of items that are usually found in intelligence or aptitude tests.

RELATIONSHIPS

Analogies. Various forms of items are used to test ability to sense logical relationships. The first list of items is called *analogies*. The relationship between two concepts is expressed, and the problem is to find from among several words the one expressing a concept which pairs up with the third one and expressing a relationship comparable to that expressed by the first two items. The following are samples taken from Army Alpha, Miller Mental Ability Test, and Van Wagenen's Unit Scales of Aptitude.

1. bird—sings::dog—1. fire, 2. barks, 3. snow, 4. flag.¹ ()
2. flying—birds::swimming—1. water, 2. fish, 3. sport, 4. tank.² ()
3. 1. liquid, 2. hard, 3. iron, 4. boat—solid::water—ice.² ()
4. Sheepskin—sheep::leather—1. shoes, 2. boots, 3. tanned, 4. cattle,
 5. hides.³ ()
5. week—Sunday::year—1. month, 2. September, 3. January, 4. first,
 5. day.³ ()
6. winter—season::April—1. spring, 2. month, 3. Easter, 4. warm,
 5. green.³ ()

The first analogy is not very difficult. It is relatively easy to comprehend that *bird* is to *sings* as *dog* is to *barks*, for the bird sings and the dog barks. Observe that the arrangement in item 3 is different from the others. Even though none of these analogies is very hard, some college students will err on item 6. The correct answer is *month*, for winter is a season and April is a month, but some may choose *spring* or *Easter* because it is associated with April. The association or relationship must be consistent and logical, and the ability to detect it is an indication to some extent of intellectual ability.

Analogies may also be expressed as figures and geometric forms. The two samples on page 174 from the American Council Psychological Examination serve to illustrate this type of analogy. Examination of these will make it clear that analogies of this kind may be devised that require critical and logical analysis for their solution.

¹ From the Army Alpha tests.

² From W. S. Miller, *Miller Mental Ability Test, Form A*, World Book Company, Yonkers, 1921.

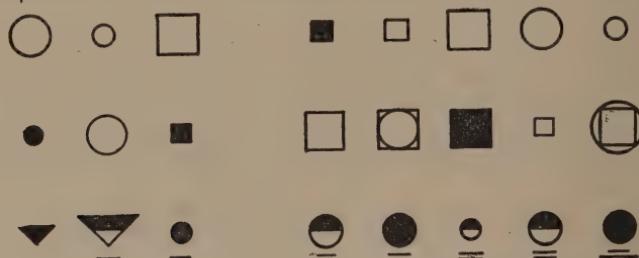
³ From M. J. Van Wagenen, *Unit Scales of Aptitude, Form A*, Educational Test Bureau, Inc., Minneapolis, 1932.

Logical Progression. The following items are samples taken from Army Alpha and are characteristic of the numerical series in that test and other psychological examinations. A definite sequence is established by the items, and the person who detects that relationship can

- a. 2 3 4 5 6 7
- b. 8 8 6 6 4 4
- c. 1 2 4 8 16 32
- d. 12 14 13 15 14 16

supply two additional numbers that will continue the sequence. In this instance, numerical concepts are involved; this is desirable because

Samples



(From *Psychological Examinations*, by L. L. Thurstone and Thelma Gwinn Thurstone, American Council of Education, Washington, D.C., 1933.)

it prevents a preponderance of verbal and word-meaning items. It may be noted that in the analogies there were items of a verbal nature and those made up of geometrical forms.

A variety in the type of items causes a better sampling of all-round general mental ability. Generally, each aptitude test is organized into parts or sections according to the type and nature of the items. Consequently, a student's special strengths or weaknesses can be determined by analyzing the scores that he makes on various parts of the test.

Logical Selection and Classification. In the two following items, the problem is to underline for each the two words that express the characteristics that the subject always possesses.

1. A WHEEL always has—1. center, 2. circumference, 3. spokes, 4. tire,
5. wood.¹
2. A BOX always has—1. depth, 2. hinge, 3. lid, 4. sides, 5. wood.¹

¹ From L. M. Terman, *Group Test of Mental Ability, Form B*, copyright by World Book Company, Yonkers, 1920.

In the item about a wheel, the correct answers are *center* and *circumference*. Some wheels are disk wheels and therefore do not have spokes; others are without tires; and many are not made of wood. Such items call for reasoning by the elimination of those items which do not satisfy the requirement.

The elimination of a word that does not logically belong with the others is the requirement of these test items. All but one of the items fit into a classification, and it should be crossed out.

1. 1. needle, 2. pan, 3. stitch, 4. thimble, 5. thread.¹ ()
2. 1. algebra, 2. arithmetic, 3. geometry, 4. history, 5. trigonometry.¹ ()
3. 1. Anna, 2. Emma, 3. John, 4. Lucy, 5. Sarah.¹ ()

In the first series of words, all refer to sewing except the word *pan*. In the second series, all the words are names of mathematical subjects except *history*, which should be crossed out. The problem is one of picking out the term that does not fit into the classification of the other terms.

Best Answer. In a strict sense, the following types of intelligence-test items do not fit into the general heading of logical relationship but are included because they are a test of reasoning and logical analysis. Their solution depends in part, of course, on a knowledge of words and the possession of information, but this is true of many types of item. Intellectual abilities of various kinds are interrelated, and there probably is a core of general ability that underlies the mental capacity that manifests itself in the solution of the various types of problem, and in aptitude or intelligence test.

1. We should "think twice before we speak," because:
 1. We may think of more things to say.
 2. We are then more sure to say the right thing.
 3. If we speak too quickly, we may stammer.¹
2. Freezing water bursts pipes because:
 1. Cold makes the pipes weaker.
 2. Water expands when it freezes.
 3. The ice stops the flow of water.¹
3. The saying, "A bad workman quarrels with his tools" means:
 1. A bad workman is usually quarrelsome.
 2. If the workman loses his temper, he is likely to break his tools.
 3. A bad workman often excuses himself by blaming his tools.¹

¹ *Ibid.*

In each of these examples, one of the three answers is the best, and the individual being examined must reason out why two other possible answers are not so good as the best one.

INFORMATION

In many psychological, aptitude, or intelligence tests, there is usually a page of items on general information. The assumption is that, on the average, the extent of a pupil's general information is related to his general mental abilities. It is assumed that pupils have enough opportunity to be informed and also that the person with the greater intelligence will seek out more information. It has been demonstrated that scores on an information test correlate with other sections of an aptitude test and also with the test as a whole.

1. A rudder is a part of 1. an automobile, 2. an engine, 3. a boat, 4. a gun, 5. a radio.¹ ()
2. A knot is a measure of 1. electricity, 2. land distance, 3. area, 4. air distance, 5. ocean distance.¹ ()
3. A trowel is mainly used by a 1. carpenter, 2. plumber, 3. farmer, 4. painter, 5. mason.¹ ()
4. Church members are organized into 1. parties, 2. denominations, 3. associations, 4. clubs, 5. labor unions.¹ ()
5. Alfalfa is a kind of 1. hay, 2. corn, 3. fruit, 4. rice.² ()

Some evidence indicates that range of information is influenced more by opportunity and training than are some of the other tests. A school can, for example, emphasize training in the acquiring of much general information, and the pupils of such a school might do a little better than they otherwise would. Furthermore, pupils in poor schools are less well trained for such a test than are pupils in good schools.

Added years of living also seem to influence the extent of general information. When tests have been given to adults whose ages cover a wide range, it is discovered that although the scores on some sections decline with age the scores on the section on general information increase. The increase is not very great, and it may be concluded that the various influences mentioned, such as better schooling and additional opportunities, do not invalidate the value of the information test as part of a general aptitude test.

¹ From Van Wagenen, *op. cit.*

² From Army Alpha, *op. cit.*

VOCABULARY

Knowledge of words is regarded by most psychologists as a valid index to general mental ability. Some psychologists express the belief that the best single indication of a person's general intelligence is the number of words whose meaning he knows. Nearly all aptitude tests include sections on word meaning. Incidentally, word meaning is tested to a greater or lesser degree by all sections that include words in series, sentences, or paragraphs.

Tests of word meaning are arranged in several ways; the following examples show some of the usual forms. In the first two examples, words are given, and the object is to select one that means the same or about the same as the first word given. Items are also arranged so that the word of opposite meaning is to be selected. Such items are not illustrated here. In some vocabulary tests, series of word pairs are given, and the subject is asked to indicate whether their meanings are the same or opposite. Samples 3 and 4 illustrate this kind.

1. hostile—1. greedy, 2. unfriendly, 3. favorable, 4. strict, 5. amused. ¹	()
2. origin—1. beginning, 2. purpose, 3. failure, 4. attempt, 5. idea. ¹	()
3. exit—entrance.....	same—opposite ²
4. agile—nimble.....	same—opposite ²
5. 1. many, 2. ill, 3. few, 4. down.	&
	(same) (opposite)
6. 1. gay, 2. last, 3. long, 4. happy.	&
	(same) (opposite)

A good arrangement of the vocabulary test is that given by items 5 and 6. In each of the series, two of the words are either essentially the same or the opposite; the object is to select a pair of words of each series that is the same or opposite in meaning and to indicate their numbers under the proper heading. This form of the vocabulary test is one of several variations used by various authors.

ARITHMETIC TESTS

Some psychologists regard arithmetic problems as particularly good elements in an intelligence test, and consequently several tests include

¹ From Van Wagenen, *op. cit.*

² From Terman, *op. cit.*

³ From L. L. Thurstone, and Thelma Gwinn Thurstone, *Psychological Examination*, American Council of Education, Washington, D.C., 1933.

a section of arithmetic problems. The following are illustrative, and no comment is necessary:

1. If you walk 4 miles an hour for 3 hours, how far do you walk? ()
2. A man's income is \$2,000 per year. If he pays $\frac{1}{4}$ of his money for board, 15 per cent for clothing, and $\frac{5}{12}$ of the rest for incidentals, how much does he save? ()
3. A ship has provisions to last her crew of 800 men 4 months. How long would they last 1,200 men? ()

SENTENCE MEANING

Two types of this test are presented here. The arrangement illustrated with sentences 1, 2, and 3 provides for underlining either *yes* or *no* to indicate whether or not the subject understands the meaning of the sentences. Sentences of the kind given are good tests of vocabulary ability and to a lesser degree are tests of general information. Obviously, those two abilities are involved in many test situations.

- | | | |
|---|-----|----|
| 1. Are cartoons made by cameras? | Yes | No |
| 2. Do hobos ever wear dilapidated garments? | Yes | No |
| 3. Are conspicuous objects readily seen? | Yes | No |

The words in sentences 4, 5, and 6 have been disarranged, and the problem is to rearrange them in the proper order so that the truth or falsity of the sentence can be determined. This arrangement represents another variation that helps bring about a more complete and thorough testing of abilities.

- | | | |
|---|------|--------------------|
| 4. north all railroads south and run..... | True | False ³ |
| 5. pays cautious it be to often | True | False ³ |
| 6. sleepy work is is hard it to when one..... | True | False ³ |

COMPLETION

Another type of problem generally appearing in the aptitude, or psychological, examination is the completion test. This type will be the last to be explained in detail. The examples given here are both verbal and pictorial in character.

Directions: Think of the most appropriate word to complete each of the sentences. The number in each space indicates the number of letters in the

¹ From Army Alpha, *op. cit.*

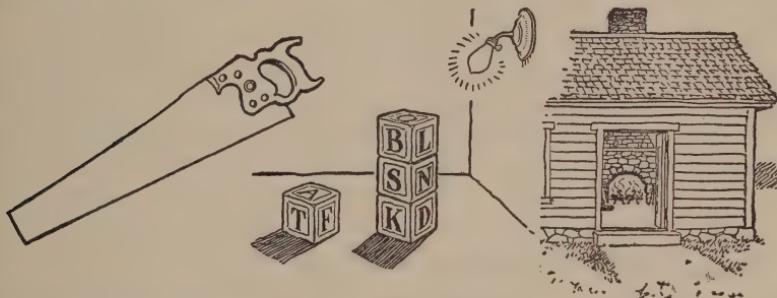
² From Thurstone, *op. cit.*

³ From Terman, *op. cit.*

most appropriate word for that space. Do not waste too much time on any one sentence, as you will be credited with one point for every word correctly supplied.

1. (3) is a fluid material used for writing and printing. _____¹
2. A (7) is a legal dissolution of the marriage relation. _____¹
3. The memoirs of one's life written by oneself are called an (13). _____¹
4. A (7) is a kind of cap used in sewing to protect the finger when pushing the needle. _____¹

The word that will fit into or complete the first sentence is *ink*, and the word for the second sentence is *divorce*. The reader may complete the other sentences.



(From *Myers Mental Measure*, by Caroline E. Myers and Garry C. Myers, Newson and Company, New York, 1921.)

The completion test is several decades old and has been used extensively in psychological work. It is regarded highly and is used in achievement as well as aptitude tests. In the achievement test, certain key words are left out of definitions and other expressions; the extent to which a subject can fill in the missing words measures his knowledge of the subject. In an aptitude or psychological test the items are more general in nature, thus testing general aptitude rather than special knowledge or ability.

The principle of the completion test has also been adapted to pictures. Parts have been left out whose omission the subject must detect and then supply the missing part or parts. The three pictures are examples of the completion test involving pictorial concepts rather than verbal ones.

Some part or element in the picture, necessary to make it complete, logical, or consistent, is missing. For example, the first picture shows a saw without teeth.

¹ From Thurstone, *op. cit.*

The material presented here is not exhaustive but is illustrative of most of that found in psychological tests. In the illustrative material given the directions test was omitted. In such a test, either oral or written directions are supplied that the subject must observe. In the test involving a series of figures or pictures the subject is told to draw a line in various ways, such as going over some and under others or back and forth in certain specified ways. Directions may include crossing out a picture and putting a cross or dot under others or at various places. The directions vary in complexity and are given one at a time. The subject must retain the directions in mind while they are being given and then execute them. The direction test is considered a good one and is included in both group and individual mental examinations.

The illustrations given are the materials that are used to test intermediate, upper, high-school, and college students, as well as adults in general. Lower-grade test material is more pictorial in nature and less verbal. For younger children the individual mental examination is more satisfactory. The contents of the most commonly used tests have been described, and the nature of the material used throughout parallels in a general way the content of many tests for the various age levels.

Intercorrelation of Subtests. It was pointed out in connection with some of the subtests that a certain core is common to most of them. Word knowledge, reading ability, and a fund of general information are major elements in this core and are incidentally tested by sections of a test not specifically designed to do so. Because there is a core common to most abilities, there is a correlation between them. The correlation between two parts of a test should be a moderate one. If it is very high, the two parts are measuring the same capacity and thus constitute unnecessary duplication. If the parts of a test do not correlate at all or correlate very little, they probably do not measure general capacity. It is most desirable for the subtests to correlate a moderate amount, for then they do not have the deficiencies just given but measure different phases of intelligence and thus contribute to both the extensiveness and the thoroughness of the composite test. For this reason, the group intelligence test is composed of several different sections that have some features in common but are still sufficiently unlike to test different capacities.

Norms and Standards. A psychologist, in making a test, brings together the items that he thinks are adequate. He gives his test to a comparatively large number of pupils, covering the ages for at least most of which he expects the test to be designed. After preliminary

experimentation and possibly the giving of the test to more children, he calculates the average scores for children of various ages.

If his test is designed for children ranging from age 5 to 10, he discovers the average scores for children 5 years, 5 years 1 month, 5 years 2 months, 5 years 3 months, 5 years 4 months, and so on up to 10 years. These are called the *norms*, or *standards*, for those ages and indicate the M.A. equivalents for given scores. Let us illustrate with the example of a score of 52, which according to the standards is the average score obtained by children who are 8 years 6 months old. That means that a score of 52 represents an M.A. or mental level of 8 years 6 months. Let us assume further that a child who is 8 years 1 month old obtains that score. His M.A. is 8 years 6 months, and his I.Q. can be obtained by dividing 8 years 6 months by 8 years 1 month, which gives an I.Q. of 1.05 or 105.

The I.Q. is calculated for any child the same way. His score on the intelligence test is looked up in the book of norms to determine the M.A. equivalent of that score; and that M.A., in turn, is divided by the C.A. of the child to determine its I.Q. This will be discussed in further detail in the next chapter.

SUMMARY AND REVIEW

Mental tests had their beginnings as effective instruments for measuring mental abilities when Binet and Simon arranged various test items according to age level and published their examination in 1905. Binet devised an age scale by arranging the tests at age levels according to difficulty, and the principle used in the original Stanford Binet test is used today in the recent revisions. Cattell tried in the 1890's to measure mental ability, but he really tested sensorimotor ability rather than the higher mental processes, and consequently his measurements had little value in discovering general mental proficiency.

The basal age is the highest age level at which the subject can pass all the tests; and during the course of the examination he is tested until he fails all the exercises of a given age level. The M.A. is determined by adding up the values for all the tests passed; it is then divided by the C.A. to obtain the I.Q. The relationship between M.A. and C.A. gives an index of brightness or the rate of mental growth.

The tests in the Terman-Merrill revision of the Stanford Binet contain both object and verbal material, which is graded according to age level from year II up through superior adult. The tests are varied in nature but are planned to measure power of association, memory, reasoning ability, and imagination.

The Stanford Binet test is an individual test; with it, only one individual can be examined at a time. Group tests were being devised in the early and middle teens of this century; during the First World War in 1917, this work was accelerated by the formation of Army Alpha. Following the war, many group tests were devised by means of which numbers of pupils could be tested at one time. A number of the exercises in the group intelligence test are analogies, logical progression, logical selection, general information, best answer, arithmetic, reading, and completion. Most of these tests are verbal, but some are non-verbal and consist of pictures, numbers, and various geometrical forms. They are designed to examine the various mental processes whose testing is also attempted by the individual test.

Standards and norms are prepared that give the mental level or M.A. equivalent of any given score. The M.A. is divided by the C.A. to obtain the I.Q.—this process being the same for both group and individual tests.

Test Your Thinking

1. Because intelligence testing is a comparatively new practice, it is probable that some fundamental improvements in testing will be discovered. Comment.
2. Do you think that Paul was truly dull and decidedly under average in intelligence and Anna was truly bright and above average?
3. Why was the principle of Binet and Simon successful while that of Cattell was not?
4. A child seven years and one month old was tested by the 1937 Stanford Binet. He passed all tests at the five-year level, four at the six-year level, three at the seven-year level, one at the eight-year level and one at the nine-year level. What is his M.A.? What is his I.Q.?
5. Discuss whether or not you feel that the elements in the group intelligence test measure general intelligence adequately.
6. The size of a person's vocabulary is considered as a fairly reliable index to his intelligence. Comment.
7. It is often said that intelligence tests do not test intelligence but that they test the products or results of schooling. Comment.
8. During the Second World War, general intelligence tests, referred to as a classification test, were used to measure the general aptitude of the inductees. Army Alpha was used in the First World War. The use of tests in both wars indicates that the general intelligence test has proved useful. Comment.

References

- BOYNTON, P. L.: *Intelligence, Its Manifestations and Measurements*, D. Appleton-Century Company, Inc., New York, 1933.
FREEMAN, F. N.: *Mental Tests*, Houghton Mifflin Company, Boston, 1939.

- GARRETT, H. E., and M. R. SCHNECK: *Psychological Tests, Methods, and Results*, Harper & Brothers, New York, 1933.
- PINTNER, RUDOLF: *Intelligence Testing*, Henry Holt and Company, Inc., New York, 1931.
- PULLIAS, E. V.: Should an Individual Know His Own I.Q.?—A Mental Health Problem, *Elementary School Journal*, 40 : 277-283, 1939.
- ROSS, C. C.: *Measurement in Today's Schools*, 2d ed., Prentice-Hall, Inc., New York, 1947.
- TERMAN, L. M.: *The Measurement of Intelligence*, Houghton Mifflin Company, Boston, 1916.
- TERMAN, L. M., and MAUD A. MERRILL: *Measuring Intelligence*, Houghton Mifflin Company, Boston, 1937.

CHAPTER IX

INTELLIGENCE AND ITS RELATIONSHIP TO OTHER QUALITIES

What to Look For. Learn the meanings given for intelligence, and select the one that you think most satisfactory.

What are the factors of power, speed, altitude, and width of intelligence?

How can the measurement of what a person knows and can do indicate his intelligence? On what basis is it concluded that intelligence tests are valid tests of intelligence?

Learn the meaning of the three kinds of intelligence, abstract, mechanical-motor-concrete, and social. What factors or elements constitute intelligence according to some psychologists?

Learn the meaning of mental age, intelligence quotient, and chronological age. Be able to calculate I.Q.

Learn the differences in children who have the same I.Q. but different C.A.'s and also the difference in children of the same M.A. but different I.Q.'s.

How can children be classified so that they will have approximately the same C.A., I.Q., and M.A.?

Note the nature of the distribution of intelligence, and learn the different classifications of intelligence.

What are the personality, physical, and character qualities of bright and dull children?

Learn what the findings are from the studies of gifted children.

Introduction. A little over 30 years ago a professor in a Middle Western university was describing intelligence and how to measure it by the use of the Binet tests. A member of the class was unconvinced and contended at some length that such an intangible quality as intelligence will always elude any effort to define and measure it. The professor listened patiently and after class detained him and asked if he had ever used intelligence tests. The student said he had not and agreed that he would like to learn how. As a result, he tested a number of boys in his neighborhood and learned much about them that helped explain their characteristics and behavior. Incidentally, this young man

later became an eminent psychologist and made several important contributions to the measurement of intelligence and to the understanding of its relationship to other qualities.

Definition and Meaning of Intelligence. There is little agreement even among psychologists on a definition of intelligence. In a sense, this disparity of opinion is not undesirable, for it allows the expression of a greater number of concepts and includes more aspects. Intelligence has been variously defined as the ability to do abstract thinking, the capacity to learn, the ability to respond in terms of truth and fact, and the ability to adjust to one's environment. Other definitions have been given also, but these are enough to indicate the range of the definitions. In the field of educational psychology the definition of intelligence as the capacity to learn is as satisfactory as any. We judge a pupil's intelligence by the quickness with which he can learn and by the amount that he has learned.

The intelligence of a pupil can be measured by the difficulty of the tasks that he can do. Their difficulty is, in turn, determined by the percentage of people in a specified group who can do them. For instance, in the case of twelve-year-old children who are working arithmetic problems or defining words, the easiest problems are those which all can solve, and the easiest words are those which all can define. The hardest are those which none or very few can solve or define. The degree of difficulty of such items can be determined by giving them to older children and to adults.

The child who can do more of the difficult tasks or more of those in which most children fail is the more intelligent. The altitude, level, or power of his intellect is determined by the most difficult tasks that he can do. The range, or width, of his intellect is determined by the number of tasks that he can perform at each level. There is a close correspondence between altitude, on the one hand, and width, or range, on the other; the person who has mental power to reach a high altitude of performance can generally do more at each level than a person with a lower level of capacity.

For example, a comparison of those twelve-year-olds who can define words missed by 95 per cent of their age group with those whose limit is reached by defining words missed by 50 per cent of the age group shows that the former can also define more of the words that are missed by only 10 per cent of the twelve-year-olds than the latter can. In other words, those with the higher level of ability can also do better at the lower levels. At such low levels, where the ability to achieve is too widespread to distinguish a child of higher from one of low mental

power, those of greater mental power can be discovered by the speed of their performance.

Two very important intellectual factors are power and speed. Power indicates the ability to solve problems, follow directions, memorize, define words, see relationships, integrate a whole out of parts, etc. Speed refers to the quickness with which one can reach the correct solution, define the word, etc. Power and speed are closely related, for ordinarily a person is quick in accomplishing tasks because of his mental power, or altitude. A person of high mental power can do most tasks easily and therefore rapidly, but he will do relatively much more slowly the tasks of a difficulty near the limit of his intellectual altitude.

There are some exceptions to the general relationship of speed and power. Some children and adults of high mental capacity are deliberative in their nature and are so constituted emotionally that when they are put under pressure to work rapidly they do so very poorly. Speed tests, which are often used in school, are harassing to pupils of this nature. In fact, it is both psychologically and socially unsound to stress the use of speed—especially unsound in a society that is stressing recreation and living at a more moderate tempo.

Intelligence is quantitative in the sense that it is measured by the number of tasks that one can do. The child who can define more words and solve more problems than another child of the same age is brighter, or more intelligent, than the latter child. The intelligence test cannot, however, include all tasks; it therefore contains what its author regards as a good sample of tasks. These, varying from the easy, which all can do, to those which none can do, are arranged to measure adequately a pupil's ability to perform all tasks.

Measurement of Native Capacity. Long and heated controversy has been waged over the question whether the abilities measured by the intelligence tests measure true capacity or reflect teaching, educational opportunities, and environmental advantages. According to the latter point of view, a person's ability to read, to memorize, or to define words reflects his training and not his innate capacity. It is, of course, true that many abilities measured by mental tests are largely acquired abilities. There can be little dispute about this. The point that the mental tester makes, however, is that in general acquired abilities are in proportion to one's native capacity. What one has acquired is an index to one's power to acquire, or to learn. Thus the extent of one's vocabulary, capacity to comprehend directions, or ability to select the best answer indicates the relative degree of native brightness. Such a theory implies, of course, that children have had the same opportunity

to acquire all the abilities tested by mental tests. Ordinarily, it is true that children have enough opportunity; consequently, differences in performance involving mental concepts reflect fairly accurately the power for acquiring ability, or the capacity to learn, that we may call *intelligence*.

There are differences in the circumstances of life that equip some pupils better than others with the materials included in intelligence tests. Children raised in homes where only foreign languages are spoken are at a disadvantage in a mental-test situation, especially in their earlier years. An especially rich or impoverished environment affects the measured intelligence of preschool children, but by the time children have reached the upper grades and high school, the abilities measured by intelligence tests indicate fairly well their capacity for acquiring those abilities.

MENTAL TESTS AND THE MEASUREMENT OF INTELLIGENCE

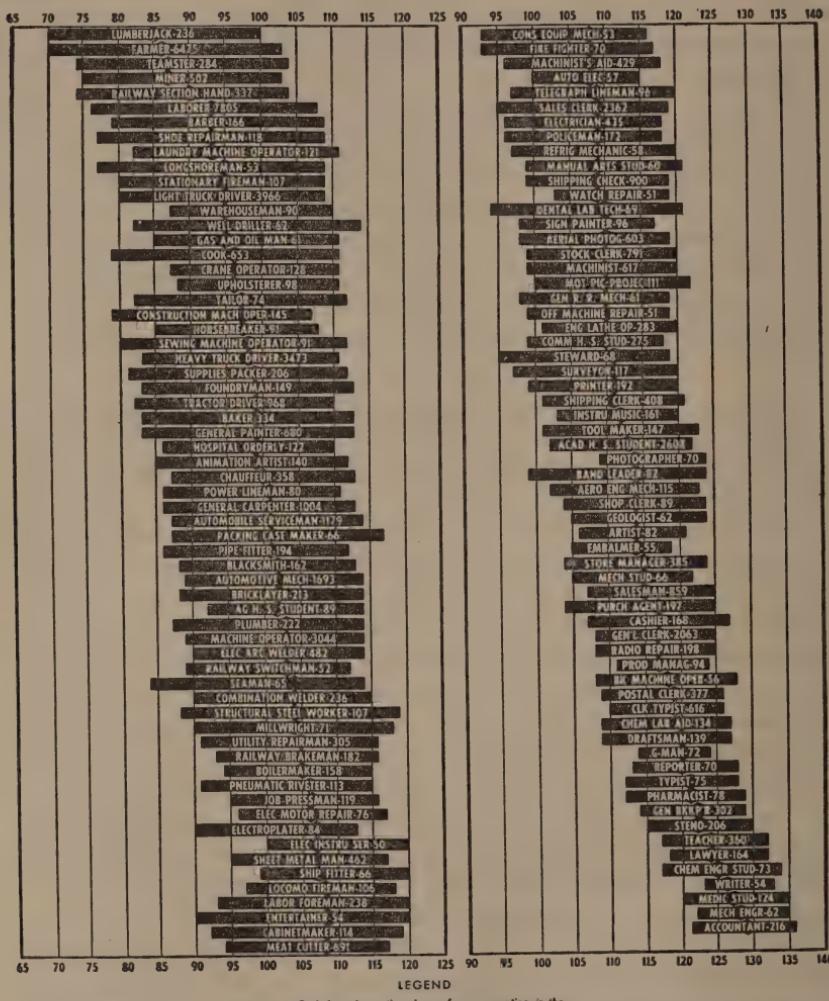
The evidence that intelligence tests are valid, that they test intelligence rather than something else, is derived largely from experiences with school children. The use of mental tests in the school situation has provided us with most of the data showing that these examinations measure a capacity that is very important.

Some evidence of the validity of the mental test is to be found by comparing the ability of the youngest and oldest children of a given grade. It will be discovered that, for the most part, the oldest children in the grade obtain the lowest scores and the youngest obtain the highest ones. Thus in the sixth grade, where the average age is eleven or twelve, the children who are ten years old will score higher than those who are fourteen. Although the older children have had 4 years more opportunity to learn than the younger, they do not have so much mental ability. The principal reason for the differences must be that the younger ones have more native capacity.

Furthermore, success in these tests corresponds with ability in school. The correlation between mental-test scores and success in school as measured by school marks is about .50. Moreover, those who have most ability, according to these tests, continue longest in school. Those who have, on the average, the lowest ability drop out earliest in their school careers. Thus there is a fairly strong relationship between success in school and mental-test ability.

There is a positive correlation also between teachers' estimates of the brightness of their pupils and the I.Q.'s of the students as determined by mental tests. The correlation is not perfect, being about .50.

Still, it is large enough to indicate to some extent the validity of the tests.



Each bar shows the place of an occupation in the AGCT score. As indicated below each bar shows the middle fifty per cent of scores in that occupation.

CIVILIAN OCCUPATION (NO. OF CASES)

PERCENTILE 25 50 75

FIG. 11. Occupational status and Army general classification test score. (Adapted from *Examiner Manual for the Army General Classification Test*, published by Science Research Associates.)

Among adults, there is a relationship between vocational status and ability in these tests. Empirically, we know that the professions call for a higher order of mental ability than unskilled labor. In general, occupations are classified from the professions at one end of the scale

to unskilled labor at the other, presumably according to the amount of intelligence needed by the members of those occupations. Figure 11 indicates that the order is a logical one, although there is much overlapping of ability.

Intelligence, or Aptitude. Most of the evidence for the validity of intelligence tests is in the form of success in the school situation. Such factors as age in a given grade, school survival and elimination, correlation of mental-test results with school marks, and teachers' estimates pertain to the school situation. Mental tests have proved most useful in the school situation for indicating the aptitude of children for doing schoolwork. Consequently, these tests have been called *aptitude tests*. We speak of those tests given to grade- and high-school students as *school aptitude tests*; more specifically, those which are used with high-school graduates and college students are called *college aptitude tests*.

These tests measure well the mental aptitude that a student possesses for doing his schoolwork, but they do not indicate so well what every individual student actually will do. There are many reasons why some students do not achieve so well in school as they are able to. The most common one is that they do not work conscientiously and systematically. They may not be interested, although, in some instances, the fault may lie with the teachers and the school rather than with the child. On the other hand, some pupils who have low aptitude according to the tests achieve fairly well or better than expected because of unusual diligence and application.

It should not be charged, however, that the results of the aptitude test indicate nothing because of some inconsistencies between expected and actual achievement. They indicate fairly well the potentialities of the individual children. The problem of the school is to stimulate and guide children to perform and achieve in accordance with those potentialities. The school will doubtless always fail with some children; but if it tries in many ways to adapt its methods and content to the individual differences in the aptitudes of children, it will succeed much better than it does at present.

VARIOUS KINDS OF APTITUDES AND CAPACITIES

Abstract Intelligence. The aptitude, or capacity, that has been discussed here is an aptitude involving words, numbers, and other symbols. It is an aptitude for learning to read, for working problems expressed in words and symbols, for memorizing verbal material—in general, the capacity that expresses itself in effective behavior with words

and symbols. This type of intelligence is referred to as *abstract* or *verbal intelligence*. It is the type most important for success in the learning situation in school, for it is necessary for success in reading, arithmetic, geography, history, and other academic subjects.

What are the elements, or factors, in intelligence? This question has challenged scholars for centuries. According to the analyses of Holzinger and Thurstone, intelligence is made up of factors, or elements, such as perceptual capacity, memory, number and mathematical ability, facility in use of words, inductive and deductive reasoning, and space visualization. In other words, intelligence according to their analyses involves the use of words, spatial relationships, and numbers and other mathematical symbols, and the degree of intelligence depends on perception, memory, inductive and deductive reasoning, and space visualization.

The first requirement of the mind is that it perceive and comprehend, and intelligence will vary according to degree of perception and comprehension. The mind must also remember what it perceives in order to be intelligent. The tools, or means, of intelligence are words, symbols, and space concepts, and the processes of intelligence consist in the use of these means in reasoning. Intelligence varies from person to person according to the capacity to perceive, comprehend, and remember and according to the effective use of the symbols and tools involved in thinking and reasoning.

Mechanical, Motor, or Concrete Abilities. In addition to the abstract, there are other phases of aptitude, or capacity. One of these is the mechanical, motor, or concrete. This aspect of intelligence refers to aptitude, or capacity, for dealing with situations involving objects or things. The boy who is apt at handling tools, taking a clock apart and putting the parts together, repairing an automobile, finding and replacing a blown fuse probably has a high order of mechanical intelligence. He is successful in solving problems involving concrete, or objective, materials.

Tests have been devised also for measuring motor ability and mechanical aptitude. The mechanical aptitude tests generally consist in assembling the parts of various mechanical devices, such as a mouse-trap, doorbell, three-piece clothespin, and bicycle bell. A widely known test of this kind was devised by Stenquist; and the Minnesota Assembly Test by Paterson, Elliot, and others is a revision and extension of the Stenquist test. Mechanical assembly tests have been used quite extensively with school children in connection with industrial courses. The correlation between the ability measured by mechanical-assembly

tests and general, or abstract, intelligence is comparatively low, indicating that mechanical tests measure a capacity different from that measured by the usual mental test.

In the field of physical education the term *motor abilities* is used to describe athletic and physical skills and abilities. We say of the person who can execute difficult dance steps, who can throw and catch a ball skillfully, who can do acrobatic stunts, who can juggle balls and other objects, who can dodge quickly, who can play baseball, football, basketball, golf, and similar games well, or who can handle his body with grace and skill that he has a high order of motor ability.

People differ in the degree to which they are possessed of motor skills. At one extreme are the very awkward, those who seem to be all thumbs and feet, as we say, and who have very little aptitude for athletics and sports and consequently no interest in them. At the other extreme is the renowned dancer, the famous athlete, the great magician, and the outstanding acrobat. Most people fall between these extremes in motor skills, with a concentration about the average, as is the case with most human characteristics and abilities.

Social Abilities. This phase of human behavior pertains to the capacity to behave effectively with people. A person who can deal well with others has social intelligence. Personality and character traits are closely related to, if not an integral part of, social intelligence. Temperament, disposition, attitudes, honesty, judgment, and humor are factors that are important in determining how well a person gets along with others.

Many persons fail in life because of poor social intelligence. Probably more people fail because of this deficiency than because of inadequate abstract intelligence. Ordinarily, social and abstract intelligence go hand in hand, but there are people relatively high in one and low in the other.

The politician who is cordial and friendly and whom the people like and therefore vote for has a high capacity for social relationships. So also has the salesman who is gracious and friendly and as a result usually makes the sale because the prospective customer favors the salesman he likes or finds it hard to say no to one whose personality is very likable. The teacher whom the pupils have confidence in and are fond of and who gets along well with her fellow teachers is well developed socially. The student who has many dates, who is a leader in school activities, and who gets many votes when a candidate at the school elections has good social qualities.

A person of high social ability is a well-adjusted person who is usu-

ally in good physical health and who must be in good mental health in order to be a successful social being. A person well developed socially is friendly and comparatively free from jealousy, has good habits, and in general rubs people along the grain and not against it.

People of Various Abilities. Usually, good qualities go together in the same person. More often than not, if an individual has good abstract intelligence, he also has good social understanding and ability. Similarly, if a person has high mechanical intelligence or a high order of motor abilities, he is more likely to be above average socially and also in his general intelligence. But there are those who are high in one quality and low in others.

Take, for example, a certain young man on a college staff who had a very good mind, as his colleagues would say. For advanced students, he was regarded as one of the most stimulating teachers in the college. He was very alert mentally, his fund of knowledge was unusually large, and his ideas showed that he had the power of penetrating deeply into his subject.

But socially he was a different man. At times he seemed charming. But if crossed a bit, he became disagreeable, and often he lost his temper. He did not have the capacity to meet people with warm cordiality. His circle of friends was small, its members changed often, and hardly anyone remained a friend very long.

This man's mechanical and motor skills were poor. He had never engaged in sports to any extent and seemed to be without mechanical sense. He operated an old automobile and had no ability to make even the simplest repairs and adjustments. Here, then, is an example of a young man brilliant of mind, therefore having high verbal or abstract abilities, but short of social and motor abilities.

On the other hand, another young man is good all round. He thinks straight, understands what is going on, and in school did an excellent grade of work. He is good in music, being able to play a number of instruments, and these abilities call for both abstract and motor skills. The abstract intelligence consists in understanding and interpreting the written music, and motor and mechanical abilities are involved in playing the piano, violin, and horns. He also shows that he has mechanical abilities by his skills with motors. For example, when on a fishing trip his outboard motor was not working very well, he took it apart and cleaned, adjusted, and reassembled it, after which it operated perfectly. He is a good shot with both rifle and shotgun, and he can play a good game of tennis, baseball, and basketball. In fact, he is good in many sports. He also has good social qualities, as shown by the fact that he

has many friends. Many visit him at his home, and he has many friends whom he visits. He is the head of the furniture department in a large store, and those who work under his supervision have very good morale because of his skillful way of dealing with people. This young man, having a good mind, knowing how to get along with people, and having good skills for dealing with concrete things, can be classified as having good abstract social and mechanical abilities.

These three types of abilities—abstract, motor, and social—although not entirely independent of each other, are still unrelated to the extent that a person may be distinctly stronger in one than in the other. The concepts of these three types or phases of intelligence serve as a general guide for understanding the abilities and characteristics of persons. It is not well to push these distinctions in intelligence too far in their application to individuals, although a consideration of types of abilities assists in comprehending more adequately the capacities and characteristics of many individuals.

It should also be mentioned that there are other tests, such as those of musical ability, art appreciation and art ability, neurotic tendencies, vocational interests, honesty, and knowledge of right and wrong. Some of these are of practical value; others are in the experimental and theoretical stages.

MENTAL AGE AND INTELLIGENCE

These concepts have been mentioned in connection with the discussion of the individual mental examination. They will be developed more fully by indicating how the authors of mental tests arrive at standards for determining mental-age levels. In developing an intelligence test, the author will assemble and arrange the materials that he wants to include in his test, but he does not have a dependable instrument until he tries it out and establishes norms or standards for it. For example, he must give it to many representative children of the ages for which it is designed in order to discover the average scores for children of those different ages. The average score for six-year-olds will represent a mental age of 6; that of seven-year-olds, a mental age of 7; etc. The author of a mental test generally provides a manual containing norms for a range of ages expressed not only in whole numbers but also in years and months, such as 7 years 1 month or 7 years 2 months.

We can illustrate the procedure for determining mental status by using as an example a child eight years one month old, who was given an intelligence test and obtained a score that is the normal or average score for children ten years two months old. Thus, this child has an

M.A. of 10 years 2 months. Knowing his C.A. and his M.A., we can determine his brightness, which is expressed in terms of the I.Q. The formula for I.Q. is

$$\text{I.Q.} = \frac{\text{M.A.}}{\text{C.A.}}$$

In this example,

$$\text{I.Q.} = \frac{10 \text{ years } 2 \text{ months}}{8 \text{ years } 1 \text{ month}}$$

or

$$\frac{122 \text{ months}}{97 \text{ months}} = 1.26$$

In calculating the I.Q., it is preferable to change both C.A. and M.A. to months. The decimal point is usually dropped, and we say that this child has an I.Q. of 126.

The mental growth of this child has been more rapid than average or normal. If it had been just average, it would have equaled the chronological age, and the I.Q. would have been 100. This child, however, has reached an M.A., or level, above his C.A. He has had an average mental growth of more than 1 year each calendar year. The I.Q. of 126 indicates that he has grown mentally at the rate of 1.26 years each calendar year.

The I.Q. indicates the rate of mental growth of a child. In the example given, the child has lived 8 years 1 month, or 97 months, but has grown mentally at an average rate of 1.26 months per month, or 1.26 years per year. If 8 years 1 month, or 97 months, is multiplied by 1.26, a mental age of 10 years 2 months, or 122 months, is obtained. This is the mental age of this child as indicated originally. In other words, if the I.Q. and C.A. are known, they can be multiplied to obtain the M.A.

Similarly, we can calculate the I.Q. of a child whose mentality is lower than average. Such a child has an M.A. under his C.A. and an I.Q. under 100. For our problem, we shall find the I.Q. of a girl who is six years eight months old and whose performance on a mental test is equal to that of the average of children five years four months old. Her M.A. is therefore 5 years 4 months, or 64 months. Divide 5 years 4 months, or 64 months, the M.A., by 6 years and 8 months, or 80 months, the C.A.

$$\text{I.Q.} = \frac{64}{80} = .80$$

This child has grown mentally at a rate that is only about 80 per cent of the average for all children. It has taken her 6 years 8 months to

reach a mental level of 5 years 4 months. If her rate of growth, .80, is multiplied by the time she has been growing, 6 years 8 months ($.80 \times 80$ months), the M.A. of 64 months, or 5 years 4 months, will be obtained.

As has been said above, the I.Q. indicates the rate of mental growth of children. It expresses the size of the yearly increments that are made to a child's mental level. Furthermore, by indicating the rate of mental growth, the I.Q. may also be regarded as an index of brightness.

An eight-year-old child, for instance, whose mental growth is characterized by an I.Q. of 125 is obviously brighter than one with an I.Q. of 75. The brighter eight-year-old has reached the mental level of an average ten-year-old, whereas the duller one is equal to the average six-year-old.

Children of the Same I.Q. but Different C.A.'s. Children may have the same degree of brightness but differ in their ability to learn because they vary in C.A. Obviously, two children eight and twelve years old, respectively, with an I.Q. of 100 are not equal mentally. The older child can comprehend more than the younger, not because he is brighter but because he has lived longer and reached a higher mental level. In 4 years, the eight-year-old child will have reached the mental level that the twelve-year-old now occupies and will have essentially the same mental ability. Potentially they are equal; and when both of them reach maturity, they will have essentially the same capacity for learning. Thus children of the same I.Q. have the same mental potentiality but differ in M.A. because they differ in C.A.

Children of the Same M.A. but Different I.Q.'s. Children who vary in I.Q. may be found, when measured by the general aptitude, or intelligence, test, to be of the same M.A. Their scores on the test are the same. Such children vary in C.A. and I.Q. but not in M.A. The younger pupils in this instance are brighter; the older ones are duller. Otherwise, their mental level would not be the same.

For example, an eight-year-old boy with an I.Q. of 125 and a twelve-year-old boy with an I.Q. of $83\frac{1}{3}$ have the same M.A. Both have reached a mental level of 10; in other words, both do as well on the intelligence, or general aptitude, test as the average child who is ten years old. Similarly, a ten-year-old child with an I.Q. of 120 and a fifteen-year-old with an I.Q. of 80 have the same M.A.

We may inquire whether or not brighter and duller or younger and older pupils of the same M.A. will achieve equally well if placed in the same grade. The likelihood is that for a short time the older pupil

will probably do slightly better in the academic subjects because he has been in school more years and consequently has had more teaching. Furthermore, teaching is usually adjusted to the average and below average rather than to the bright. In the nonacademic subjects, moreover, such as manual training, sewing, and penmanship, the older pupils will probably do still better.

Nevertheless, it will not be long before the younger, brighter pupils will surpass the older, duller pupils, especially in the academic subjects. The brighter pupils have higher I.Q.'s and are increasing in M.A. more rapidly than are those of lower I.Q.'s. Therefore their M.A. will soon be higher than that of the duller children. Then, being brighter and also higher in M.A., the younger pupils will be superior in learning ability to the older pupils. Of course, one can never be certain that the younger ones will be judged to be superior by the teacher, for the older children, in some instances, may work harder and appear to be better students than some of the bright younger students.

The weakness in classification by M.A. can be illustrated by considering what happens when children beginning school are admitted and classified according to M.A. Such a classification is better than the arbitrary chronological grouping that occurs when six-year-old children enter the first grade, but whatever homogeneity of ability is obtained by such a classification does not last long. Let us assume that a few with M.A.'s of 6 have I.Q.'s of 120 and that some have I.Q.'s of 86. According to our illustration, the brighter children are five years old and the duller are seven. For a time they will probably be equally apt as pupils. However, as they grow older, they will grow apart in their mental capacity. At the end of 4 years the mental age of a younger pupil will be nearly $1\frac{1}{2}$ years more than that of an older one. The brighter pupil will have an M.A. of 10.8 years [$1.20 \times (5 + 4)$], and the duller one will have an M.A. of 9.44 years [$.86 \times (7 + 4)$]. At adulthood the differences will be even more pronounced, so that if they were then found in the same class the differences in learning ability would be much more apparent.

It can be observed that, if both these children were admitted to school at the age of six, they would differ considerably more in M.A. and that after a few years the difference would be even greater. At the age of six the child with an I.Q. of 120 has an M.A. of 7.2 years, and the child with an I.Q. of 86 has an M.A. of 5.2 years. They differ by 2 years in M.A. when they begin school; but 8 years later, when they reach high-school age, they will differ mentally by 4.8 years, having M.A.'s of 16.8 and 12.0, respectively.

Classifying According to M.A. and I.Q. If the attempt is made to classify pupils according to their capacity for learning, it is well to put together in the same classes children who are of the same age and about the same degree of brightness. For example, if in a large school the children are to be classified into three groups according to mental power, the six-year-olds with I.Q.'s of 115 and over should be put in one classification, the six-year-olds with I.Q.'s between 90 and 115 in another classification, and the six-year-olds with I.Q.'s under 90 in another. The same can be done for any age.

By keeping the age the same and then classifying according to intelligence quotient, the mental age of the members of the group will be more nearly uniform, also. Other factors that should be taken into account are the classroom achievement or marks of the pupils, their social maturity, and special interests such as music, art, athletics, and industrial courses.

The principal purpose at this time in discussing the classification of pupils according to age and brightness is not as an argument for classifying pupils according to capacity for learning but to illustrate the relationship between chronological age, mental age, and intelligence quotient. However, if the superintendent, principal, and teachers wish to classify children, they should try to obtain as much homogeneity in chronological age, mental maturity, and brightness as possible and should also take into account social maturity and actual achievement. Children of the same age and mentality are likely to be of similar social maturity, although there are exceptions, of course. The same is true of marks or school achievement.

THE DISTRIBUTION OF GENERAL INTELLIGENCE

There is a wide range in human intelligence. At the lowest end are the idiots, with I.Q.'s up to 25, and at the highest are those very exceptional persons with I.Q.'s reaching probably 200. Most have I.Q.'s of about 100 or between 90 and 110. The I.Q.'s of a representative group of children seem to distribute according to the normal probability curve or approximately so. Figure 12 is a normal curve divided to indicate the proportion of various classifications of mental ability distributed according to the normal probability curve.

Those early statesmen of the United States who spoke of everyone's being created equal were apparently not cognizant of the great differences in mental capacity. Equal opportunity, even if it did exist, would not be equally realized, because of such basic differences. An analysis of Fig. 12 reveals the wide range of I.Q.'s, which are generally accepted

as an approximate indication of mental ability. However, the figure cannot be drawn to show the long "tails," or "ends," one of which should approach 0 to the left and the other 200 to the right. The tails, or ends, reaching extreme feeble-mindedness to the left and the highest intelligence quotient to the right, would extend beyond the edges of the page.

Psychologically, 50 per cent of the people are regarded as average, having I.Q.'s from 90 through 109. There is an equal percentage in the bright-normal, with I.Q.'s from 110 to 119, and dull-normal groups,

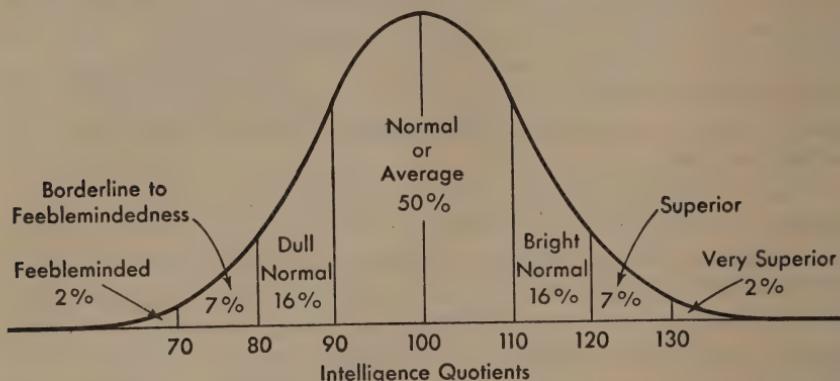


FIG. 12. Distribution of intelligence quotients.

with I.Q.'s from 80 to 89. Each of these groups includes about 16 per cent of the total. Those with I.Q.'s between 70 and 80, who are classified as bordering on feeble-mindedness, constitute 7 per cent of all people and are balanced in number by those with I.Q.'s between 120 and 130, who are classified as superior. Those with I.Q.'s below 70 are classified as feeble-minded and constitute about 2 per cent of the total. At the other extreme, we have the 2 per cent of very superior people with I.Q.'s above 130.

It should be kept in mind that Fig. 12 is smoothed and represents a composite of many findings. The curves representing actual findings have the same general shape as Fig. 12 but are not so smooth or regular. The distribution of I.Q.'s shown in Fig. 12 is as accurate as we have at the present time.

Student or teacher or parent or anyone dealing with human beings should be keenly conscious of the tremendous range in human brightness. A teacher, for example, as she surveys her class may at one moment be looking at a child with a mind that seems to "soak up" everything, a mind far beyond its years, and at the next moment at

a child of low intelligence who fails to understand most of what is taking place in the room. He expresses himself poorly, does not like any of his subjects, and wants to leave school as soon as he can. The teacher cannot tell how these two pupils differ by looking at them, but she can tell by their performance on intelligence tests and by their performance in their subjects.

Between these extremes will be found the other pupils, most of them average. Almost wherever people are found will also be found a range in capacities, and this should always be taken into account in dealing with people. Expect differences in those with whom you work.

Feeble-mindedness and Its Various Degrees. Children with I.Q.'s below 70 are regarded as feeble-minded. They develop mentally at a rate that is less than 70 per cent of the average. Psychologically, they are feeble-minded in terms of the intelligence-test standards for their ages. Some of them are socially adequate if given work that they can do. None of them can achieve satisfactorily if held to the academic work required of school children, and they are certain to fail if the teacher holds them to standards of average school achievement.

In a school was a certain boy with an I.Q. of about 70. Fortunately, he had much better personal qualities than is usual for children of his intelligence. He also had sympathetic and understanding teachers. This boy was industrious and had initiative, and he got himself a position by pointing out to a storekeeper the various little jobs that needed doing and that he could do around his store.

His teachers realized that he would never be a scholar, but they had hopes that he would be a useful citizen. In school he learned whatever academic subject matter he could. The teachers did not press him unduly, and they allowed him to be a handy man for the school building. The result was that he had a feeling of personal worth, he adjusted well to the school, and the school adjusted well to him.

If a child with a low I.Q. has special interests and abilities such as this boy had, he should be put in classes that will exercise his abilities and engage his interests or be given special opportunities. Some academic material can be taught him when he is sufficiently mature mentally. The child and his adjustment are more important than his academic achievement; he will acquire the few arithmetic or reading skills within his ability much more readily and happily if the teacher waits until he has matured to a higher mental level.

The feeble-minded cover a wide range and have been classified into three groups. Those with I.Q.'s up to 25 are classified as *idiots*. Those with I.Q.'s from 25 to 50 are called *imbeciles*. The highest order of

the feeble-minded are the *morons*. They have I.Q.'s from 50 to 70 and are least distinguishable from the normal group. Fortunately, the number of idiots, imbeciles, and morons corresponds to their I.Q.'s; there are fewest idiots and most morons. In another sense, this trend is unfortunate, for it is the morons and those with intelligence just above the moron level who, as adults, have most children and thereby perpetuate and even aggravate the problem of the mentally and socially inadequate.

Range in I.Q. among the Very Superior. There is also a great range in the I.Q. of the upper 2 per cent, whose I.Q.'s are 130 and above. If we consider the maximum I.Q. as being 200, then we have a range of 70 for the upper 2 per cent. This is essentially the range for the lower 2 per cent, or the feeble-minded, whose maximum I.Q. is about 70 and whose minimum I.Q. is not far above 0. A child with an I.Q. of 165 or over is distinctly superior to one with an I.Q. of 130. A child with an I.Q. of 130 is probably the best in 50 unselected children; in a typical community of 5,000 school children, he would be included among the brightest 100. He is not likely to have the highest I.Q., but a child with an I.Q. of 170 might be the brightest of all the 5,000 children.

THE ORGANIZATION OF ABILITIES

The Very Bright Child. Proportionately, there are few very bright children, but in most schools there is one or more. If a school does not have a particularly bright child one year, it may have such a child another year. Very bright children may be described as those with I.Q.'s of 140 and above. It is estimated that there is, on the average, 1 such child among every 400. I.Q.'s of very bright children range from 140 up into the 180's and 190's. Few indeed are there who have I.Q.'s over 170, and the number with such I.Q.'s is much less than the number whose I.Q.'s are in the 140's and 150's.

Very bright children often constitute a serious problem in school, and especially are the gifted boys likely to be maladjusted. The teacher who is successful in dealing with children whose I.Q.'s are above 140 is to be commended, for teachers often fail in dealing effectively with exceptionally bright children.

General Characteristics of Superior Children. Children who are very bright tend to be above the average in other traits, also. Rather than being small, nervous, and sickly, they tend to be larger than average, stable emotionally, and in good health. There are many exceptions even among the intellectually gifted, but on the average they

are favorably endowed in all respects. A plan of Nature is to favor in every way those whom it has favored in one particular, such as high intelligence.

Not only does Nature favor the intellectually gifted, but nurture as well. Brilliant children are generally born to parents of a higher socioeconomic status. Marked exceptions exist, of course, but the largest proportion are born to parents of good or more than average means. Consequently, they are given better care, consisting in better diet and more adequate medical attention. Furthermore, their habit and emotional training is better. These favorable environmental factors have their effect in developing other desirable attributes.

The bright child is as much a deviate as the dull one, the former being above the average and the latter below. He is very different from the average, but his differences are not so apparent as are those of the children with low I.Q.'s. Negative differences from the average, or deficiencies, make themselves more felt than do positive differences, or strength. The strength of very bright pupils is not so discernible to the teacher as the weakness of the dull, which reveals itself in every lesson.

As a consequence, the very bright child is left to take care of himself, for he ordinarily does well in his work. If the very bright child does not do satisfactory schoolwork—and some do not, according to the usual standards—the mental-test results are regarded as unreliable and he is treated as a dull child. Such treatment is most unfortunate—the worst that a bright child can be given. It is serious enough when bright children are not recognized and are given a level of instruction suitable only for average children.

Intellectually gifted children, as has been said, tend to be larger and healthier than others of their age, although this superiority is not great, being only an inch or two in height and a few pounds in weight. At about the age when children begin school the intellectually gifted are probably 4 or 5 pounds heavier than average children of the same age; at the age of fifteen they are about 10 to 15 pounds heavier. As indicated before, these differences are not large, but they do show the tendency and serve to offset the general compensatory notion that mental strength and physical weakness are associated.

The superiority of gifted children, on the average, in height and weight, especially weight, suggests that probably they are better nourished and consequently are healthier and freer from physical defects. The facts are that gifted children have fewer headaches, are less nervous, have better posture, have clearer skins, are less easily fatigued,

have fewer colds, and in general show fewer symptoms of general weakness than other children.

It must be kept in mind that not all mentally gifted children are superior to all other children in physical characteristics, emotional stability, and social adjustment. In fact, some are below average in these particulars, and a few of them are considerably below. Each gifted child must be studied individually to determine his status. If a person has one desirable trait, he is likely to have other desirable traits. If a person has one undesirable trait, he is likely to have other undesirable traits. In other words, desirable traits characterize an individual's endowment, and undesirable traits tend to go together, rather than strengths and weaknesses occurring in the same person. There are many exceptions to this, and each child must be classified, not according to the trend or a principle based on that trend, but individually.

If children are selected because they are particularly gifted in intelligence and are studied for other traits—physical, social, and moral—it will be found that they do not rank so high in the other traits, although usually above average. Similarly, if we choose a group of children who are the better one-half or best one-fourth or one-eighth because of their health and physical traits, it will be discovered that though above average on the whole in mental ability and social adjustment they are far from as high in these respects as in their physical traits, which, in this instance, were the basis for selection. In general, children as a group are not so high in other traits although they tend to be above the average in these, also, as the trait in which they are very superior or by which they are highly selected.

The Inferior Child. Children who are inferior mentally tend to be under average in other respects. If, for example, a group of mentally inferior children were selected, say, with I.Q.'s below 50, it would be discovered that physically, socially, and morally they would tend to be below average. They would be relatively higher, however, in these traits than in their mental traits. Obviously, for instance, children with I.Q.'s under 50 usually have a physical development beyond their mental development, and their motor skills are above their academic and mental skills. Even though their motor abilities are above their abstract abilities, so to speak, still the former tend to be below the general average for all children of their age.

The mentally deficient tend to be smaller in size and less robust than average and superior children. Inspection of a room of intellectually subnormal children will reveal this fact. They tend to be more nervous and more fatigued and have headaches more frequently than

other children. They are under average physically, although their physical status is considerably above their mental status. Relatively, these deficiencies are not overcome by the time adulthood is reached.

Similarly, those who are low mentally tend to make poorer social adjustments than children of high mental capacity. Delinquents, for instance, are distinctly below average in mental capacity. There are, of course, delinquents who are above average, and some are of very high measured intelligence. The modal, or average, I.Q. is probably in the middle or high 80's. The proportion of delinquents with I.Q.'s under 70, or those who may be considered feeble-minded, is several times as large as the proportion of feeble-minded among an unselected group of children.

Ability, Character, and Personality. In his study of gifted children, Terman also compared them with an unselected group on the basis of test results of selected character and personality traits. The tests were tests of honesty, trustworthiness, social attitudes, character preferences, and emotional stability.

In these tests the gifted girls and boys showed much better standings than did the unselected group. However, it must be remembered that gifted children are much brighter; possibly these children masked their true characters by giving the answers which they knew to be acceptable rather than those which reflected their true character and motives. In other words, character and personality tests may be to some extent tests of intelligence. If such tests are valid, however, it may be assumed that the character traits of gifted children are more desirable. This is interesting, for the common opinion is that intelligence and delinquency go hand in hand.

Has it not been said that if a crime has been committed within 60 miles of Boston, particularly a crime against property, you may be sure that it has been done by a graduate of Harvard University? Reference is commonly made to the brilliant shysters, the smart crooks, and the clever swindlers. A brilliant man is often considered dangerous, for it is feared that he will utilize this intelligence to defraud his fellow man. The honest man is often pictured as having a subaverage intellect and being an unimaginative plodder.

The facts show that character and intellect tend to go hand in hand. There are some bright, able men who commit crimes, particularly fraud; but the highest proportion of crime and delinquency is attributable to adults and children who are under average in intelligence.

Boys of high intelligence are frequently thought of by their contemporaries as being feminine, or "sissies." It is believed that they

like girls' games and do not care for the sports engaged in by red-blooded boys but would rather read books or play the piano. We usually associate vigorous sports, such as school athletics, with boys who have barely the academic ability to remain eligible for such activities.

Gifted boys, as a matter of fact, have about as much interest in "red-blooded" games as have unselected boys. On the other hand, it should be recognized that intellectually superior children have considerably more interest in activities more or less related to school. They especially like to read; and younger girls, in particular, like to cut out pictures, draw, and paint. This is entirely natural for intellects of high order. But intellectually gifted children are as interested in games and physical activities as are run-of-the-mine children.

There is a positive relationship between general intelligence and social acceptability. By children most accepted socially we mean those who are most often chosen as friends, given most presents, and most often selected as work and play companions. There is a tendency for brighter children to be more acceptable than duller children. The correlation between intelligence and social acceptability for any given grade is probably around .35, which is not very high but which has some significance when it represents the correlation for a single grade. Social acceptability is to a considerable degree synonymous with social intelligence. Consequently, it can be said that general and social intelligence tend to go together.

In general, then, desirable traits and characteristics tend to accompany each other. There are many exceptions, of course; but, more often than not, intelligence, integrity, health, and personality tend to be found in the same person in less than average, average, or more than average amounts. Thus a person tends to have a corresponding status in the various traits.

The Success and Failure of Gifted Children. Much of our present-day information about gifted children has been obtained by Terman and his fellow workers. In 1922 Terman made a careful study of very highly selected groups of grade- and high-school children who had I.Q.'s of 140 and over. In 1928 a follow-up study was made of Terman's gifted group, and in 1936 Terman and some associates studied the gifted group again. The records for about 1,500 gifted children were in Terman's file, and he located approximately 1,400 of them, or about 93 per cent of his original group. The original grade-school children first studied in 1922 were twenty-six years old on the average when studied in 1938, and the original high-school students averaged thirty-two years

of age. The most recent follow-up study was published in 1947 as a book with the title *The Gifted Child Grows Up*.

The following are some of the facts discovered about the progress or lack of progress of the gifted children studied in 1938, 16 years after they were first studied:

The school progress of this group of young men and women was exceptional. About 90 per cent of the boys and 85 per cent of the girls went to college; of the boys 19 out of 20 and of the girls 9 out of 10 graduated. This is an unusual record, for ordinarily not more than one-half of the students who begin college work ever finish. The college records of the gifted group are especially significant in view of the fact that "about 40 per cent of the boys and 20 per cent of the girls earned half or more of their total expenses."

About half of the boys entered the professions, 13 per cent going into law, 10 per cent into engineering and geology, 8 per cent into college and university teaching, 7 per cent into medicine, 6 per cent into religious and social work, and 5.5 per cent into the field of chemistry or physics as investigators.

The moral record of the group was better than that of the general population, but it was not perfect. Three boys had criminal records, and a number had been heavy drinkers. On the whole, however, the record of the gifted group was definitely better than average.

A special study was made of 600 of the boys, comparing the most successful with the least successful. Not all of the gifted made a success of their lives, as we commonly think of success. Some failed to utilize their very high mental capacities. Some got average and even poorer than average marks in high school and college. There were those of the gifted group who tried one job after another without success; one, for example, became a streetcar motorman, and another did clerical work, neither earning much money at this work. Others failed socially, as indicated by the fact that some divorced their wives or were divorced by them.

The successful were those who had made progress in school commensurate with their capacities and whose position and record of employment were promising. The most successful of the 600 boys, or young men as they were when studied in 1938, were compared with the least successful to see if there were any differences in their records. They had essentially the same intelligence as measured by the intelligence tests, but they differed significantly in two ways. Among the most successful, 62.5 per cent of the high-school marks were A's, while among the least successful only 28 per cent of the high-school marks

reached this level. In high school the boys in the successful group participated nearly twice as much or as frequently in extracurricular activities as the least successful group. The difference in marks indicates primarily a difference in industry and systematic effort, and the difference in participation in extracurricular activities indicates a difference in social qualities.

In evaluating his findings after having studied the boys of the gifted group, Terman makes the statement that, for people with I.Q.'s over 140, success is dependent on social and emotional qualities and ambition to do well, or a drive that leads to achievement.

SUMMARY AND REVIEW

Intelligence may be defined as the capacity to learn, to do abstract thinking, to respond in terms of right and wrong, and to adjust to one's environment.

Factors in intelligence are the power to do tasks of various difficulties, the speed of performance, and the altitude and range of the intellect. The elements or factors of intelligence have been given as memory, perceptual capacity, number and mathematical ability, facility in the use of words, inductive and deductive reasoning, and space visualization.

It is assumed that a person's mental ability reflects his true intelligence, for the amount of mental ability he has is proportional to his intellectual capacity to acquire mental ability.

The usual intelligence tests are most valuable in indicating what a person can do in school, in other words, his aptitude for schooling.

Abstract intelligence refers to ability with words, numbers, and other symbols. Mechanical, motor, or concrete intelligence refers to capacity and ability to deal with objects and things and also to skill in handling one's body. Social intelligence refers to capacity for dealing with people.

Mental age (M.A.) is mental level or maturity in terms of average age. Intelligence quotient (I.Q.) indicates degree of brightness and rate of mental growth for children. Chronological age (C.A.) is the length of time one has lived.

$$\text{I.Q.} = \frac{\text{M.A.}}{\text{C.A.}}$$

Children of the same I.Q. but different C.A.'s have different M.A.'s.

Children of the same M.A. but different I.Q.'s also have different C.A.'s.

If children of approximately the same C.A. and approximately the same I.Q. are classified, they will be found to have approximately the same M.A., also. Moreover, they are likely to be of about the same social maturity because of homogeneousness in mental ability and chronological age.

About 50 per cent of children are classified as normal, with I.Q.'s falling between 90 and 109. There are 16 per cent each of dull normal and bright normal, with I.Q.'s of 80 to 89 and 110 to 119, respectively. There are 7 per cent each of borderline and superior, with I.Q.'s between 70 to 79 and 120 to 129, respectively. Two per cent are below 70 and are classified as feeble-minded and 2 per cent over 130 and classified as very superior. Of the feeble-minded the morons have I.Q.'s of 50 to 69, the imbeciles I.Q.'s of 25 to 49, and the idiots I.Q.'s under 25.

Children with high I.Q.'s show wide ranges of physical, character, and social qualities, but in general those who are very superior in intelligence tend to be above the average in size, health, character, and social qualities. Children low in intelligence tend to be under average in these qualities.

The success of a group of adults who were gifted children is much above average, although the record is not without blemish and failure.

Test Your Thinking

1. Criticize and evaluate the various definitions of intelligence. Select the one you like, or make up one of your own.
2. The terms *altitude*, *width*, *area*, *power*, and *speed* are used to enlarge our concepts of intelligence. Describe intelligence in these terms.
3. Differentiate between abilities and capacities.
4. What evidence have you pro and con that intelligence tests test actual intelligence?
5. Discuss the relationship between the intelligence-test scores of individuals and the occupations in which they are engaged. What use can be made of such results for vocational guidance?
6. If you had a choice of being high in two of the three intelligences, or three aspects of intelligence—abstract, social, and mechanical-concrete—and low in one, which two should you choose?
7. What are the usual degrees of endowment of any given person in the various types or aspects of intelligence? For example, if a person is very high in one, how is he likely to rate in the others? and so on for different degrees of endowment in any one of the types of intelligence.
8. A child 8 years 4 months old has a score of 58 on an intelligence test, and the mental-age equivalent of the score is 9 years 7 months. What is this child's I.Q.?

9. A child 10 years 5 months old has an I.Q. of 59. What is this child's M.A.?
10. A child with an M.A. of 12-6 has an I.Q. of 122. How old is this child?
11. Discuss some of the differences in the characteristics of very superior and feeble-minded people.
12. It is often said that those low in intelligence are usually stronger and healthier than those high in intelligence. What do you think?
13. How are traits usually related in the same person? Is the tendency toward uniform endowment or endowment showing compensation?
14. Discuss the progress in adulthood of gifted children.

References

- BOYNTON, P. L.: *Intelligence, Its Manifestations and Measurement*, D. Appleton-Century Company, Inc., New York, 1933.
- FREEMAN, F. N.: *Mental Tests*, Houghton Mifflin Company, Boston, 1939.
- GARRETT, H. E., and M. M. R. SCHNECK: *Psychological Tests, Methods and Results*, Harper & Brothers, New York, 1933.
- NEMEZEK, CLAUDE L.: The Constancy of the I.Q., *Psychological Bulletin*, **30**: 143-168, 1933.
- PATERSON, D. G., RICHARD M. ELLIOT, and others: *Minnesota Mechanical Ability Tests*, University of Minnesota Press, Minneapolis, 1930.
- PINTNER, RUDOLF: *Intelligence Testing*, Henry Holt & Company, Inc., New York, 1931.
- ROSS, C. C.: *Measurement in Today's Schools*, Prentice-Hall, Inc., New York, 1947.
- TERMAN, L. M., and others: *Mental and Physical Traits of a Thousand Gifted Children (Genetic Study of Genius*, Vol. I), Stanford University Press, Stanford University, Calif., 1925.
- TERMAN, L. M., and MELITA H. ODEN: *The Gifted Child Grows Up*, Stanford University Press, Stanford University, Calif., 1947.
- YERKES, ROBERT M. (ed.): *Psychological Examining in the United States Army*, Vol. XV, National Academy of Sciences, Washington, D.C., 1921.

CHAPTER X

LEARNING CAPACITY AND SCHOOL SUCCESS

What to Look For. What can a kindergarten or first-grade teacher learn about her pupils if she gives them an individual mental examination?

Learn what the relationship is between pupils' standing on intelligence tests and their standing in the various types of school subjects.

What are the comparative intelligence-test ratings of students who progress furthest in school and of those who drop out by the way?

What are the school standings and intelligence-test rankings of students who are most likely to succeed in college?

The meaning of a correlation is explained and illustrated in terms of a correlation of .40 and .50. The explanation should be studied carefully.

Except for a few of the mentally deficient, all children begin school, but a dropping out of pupils takes place as they progress up the educational ladder. Learn what the intelligence levels of pupils are from the kindergarten through the graduate school.

Learn also what the differences tend to be in the average intelligence of students who take the various school subjects, academic, commercial, vocational, and special subjects like music and painting.

Note the difference in abilities of students in various college departments and also the difference in the quality of the student body in high schools, colleges, and universities.

Note also that, in the small schools particularly, the quality of the student body may vary from year to year.

Introduction. In the fall of the year about 3,000,000 young children will enter the first grade. Some have been in a kindergarten and so have some advantage over the great majority, who enroll in a school for the first time when they enter the first grade.

This large army of nearly 3,000,000 young children will be on the march through the American school system for many years, but the progress of their march will differ. Some will begin to falter at the start, some will fall behind, but a few of these may catch up. Some pupils will stay ahead and even increase their lead. As the march continues from grade to grade, for an increasing number of pupils the road be-

comes steeper and more slippery. In many schools, however, the roads are changed, the grade, as it were, made easier, so that more and more pupils can continue their march. Nevertheless, pupils fall by the way-side. Many drop out at the end of the eighth or ninth grade. More drop out in high school. Only a comparatively small percentage of those who do graduate from high school go to college, and of the number who begin college only about one-half finish. A few spend more than 4 years in college and work for graduate and professional degrees such as those in medicine and law.

The progress made depends in large part on the mental and personal strength of the individual pupil. It also depends on what paths and roads the schools prepare for the pupils and how the teacher helps the pupils make progress.

Predicting What a Child Can Do. From the results of mental testing the principal and teacher can judge with greater accuracy what school success can be expected of the child. Furthermore, one can predict in a general way what final vocational status a child may reach, but on that point the teacher must be very careful and conservative. If a child is carefully tested when he begins school, his success in terms of school subjects and grade progress can be anticipated considerably better than if no tests were made. In order to obtain a more reliable basis for predicting the degree of success, it is well to retest children occasionally—possibly every third year or so. Subsequent tests may overcome a part of the unreliability inherent in the testing of children before they have had school experience.

In some school systems the kindergarten teacher tests the beginning kindergartners, thus gaining almost on first acquaintance a fairly accurate knowledge of the mental alertness and mental maturity of each child. She learns in an hour or two as much about a child's mental capacities as otherwise it might take her a year to learn, and she may acquire certain knowledge about the child's mental status that she could obtain in no other way. Furthermore, in testing the child, which in a sense is a systematic interview, the teacher learns whether the child is forward or shy, expresses himself well or poorly, is interested or indifferent, can pay good attention or not, and is friendly and cooperative or the reverse. In giving the individual mental examination to a child beginning either kindergarten or first grade the teacher acquires much valuable information about the child's personality and social qualities.

If a first-grade teacher has the I.Q.'s and M.A.'s of her pupils when they enter the first grade, she has data that will help her anticipate fairly accurately what they will do in reading and arithmetic, for ex-

ample. Not all those who are highest in the mental test will be highest in reading and arithmetic, and not all who scored lowest on the mental test will be poorest in reading or spelling. A general trend is shown, however, which may guide the teacher in what to expect from her pupils both individually and as a group.

Experience and experimentation have demonstrated that a child with a mental age of 5, for example, is hardly developed enough mentally for learning how to read. Time will be wasted, for the child cannot learn to understand enough of the printed words to make more than discouraging progress. At a mental age of 6 a child can spend his time more profitably at learning to read and will make better progress. But at a mental age of $6\frac{1}{2}$ or 7 a child usually can make excellent progress in learning to read.

In this connection it should be mentioned that there are reading-readiness tests which will also help the teacher judge when a child is ready to take up reading. These tests have vocabulary elements in them, as do general-intelligence tests, but they prove a good supplement to the mental tests in judging a pupil's reading readiness.

Mental age or mental maturity is an index to arithmetic readiness, also. It has been discovered for arithmetic as it has for reading that time is wasted and bad attitudes are formed if children study arithmetic before they are ready for it. In the case of arithmetic, it is really best if only a little is done until a child is 8 or 9 years old mentally or is in the last months of the second grade or in the third grade, when it can be taken up systematically. Again, it is the best educational policy to wait until the child is mentally ready. Up to the time when a child has reached a mental age of 8 or 9, he should be made ready for arithmetic by being exposed to many numerical and quantitative concepts. There are definite methods for developing arithmetic readiness. If the reader is interested in this topic, he should consult books on the teaching of arithmetic.

Relationship between Intelligence and Achievement in School Subjects. So many correlations have been calculated between intelligence and school achievement that the relationship is fairly well known. A summary of the findings indicates that the correlations between intelligence and all school subjects are not the same. The relationship between measured intelligence and general attainment in grade, high-school, and college subjects has, however, been fairly well established. In the academic subjects, in which the verbal symbolic elements are predominant, for example, in reading, composition, history, arithmetic, English, algebra, and foreign languages, the correlation within a given group or

grade is generally between .40 and .50. Both smaller and larger correlations have been found; but, on the whole, correlations between .40 and .50 are typical.

The correlation between mental-test ratings and skills such as those involved in the mechanics of arithmetic is lower than that for arithmetic problems. Between the drill and mechanical phases of all subjects and intelligence there is less relationship. The intelligence tests indicate most accurately what a pupil will do in the more academic phases of a subject, so to speak.

Intelligence tests indicate less well what pupils will do in art, drawing, and writing. Investigators have found correlations that differ a little; but, on the average, the correlation between mental-test results and ability in these subjects is only about .20. This correlation is low, and on the basis of this relationship a teacher can hardly predict whether the bright child will write, draw, or do art work better than an average child or an average child better than a dull child. From the content, it is to be expected that the abilities measured by intelligence tests have less in common with the abilities needed in these skill subjects. The intelligence tests are more verbal, whereas these subjects call for more nonverbal abilities.

Similarly, in case of industrial subjects, such as woodworking, mechanical drawing, sewing, cooking, the relationship between attainment in those subjects and mental-test ability is low, being about .20 also. If, in addition to stressing skills and performance, these courses also consist of definite subject-matter content to be learned by the students, the correlation between mental ability and achievement in the courses will be higher, probably as high as .40.

The correlation between mental-test scores and spelling-test scores falls between the correlation of general intelligence with the academic subjects and with special subjects. The correlation between general mental ability and spelling ability is probably between .30 and .40. There is thus a definite element of general intelligence in the ability to spell words correctly. In fact, some studies indicate as high correlation between general intelligence and spelling ability as between general intelligence and academic subjects.

The value of mental tests as a basis for anticipating the achievement of pupils depends to a considerable degree on how accurately achievement is measured. If school marks are used as the criterion of achievement, the accuracy of prediction is reduced, for marks are not always accurate. When achievement is thoroughly measured by carefully devised achievement tests, the correlation between mental-test ratings and

achievement will be higher and consequently can be predicted more accurately.

Correlation between Mental-test Ratings and General School Success. When children finish the traditional eighth grade or the ninth grade of junior high school, depending on the organization of the school, many of them, most of them in fact, will go on to senior high school. Not all will succeed, and the science of education and psychology tries to determine who will succeed or fail. Better yet, it tries to determine what a student should take in high school and how a student should be treated so that he can succeed.

Considerable concern has been shown about how to predict whether or not a pupil will succeed in college. It usually costs a considerable amount to go to college. Often the high-school graduate leaves home to enroll in a college miles away. In a sense, he cannot afford to fail. If a student could be told that he probably would not succeed and thus were enabled to avoid so costly a failure, this would be helpful to him.

It has been discovered that there are almost as many high-school graduates of high abilities and good high-school records who do not go to college as those who do. Perhaps they have not the ambition or drive that they should have. On the other hand, some of them do not go to college because they cannot afford it. We say of John and Mary, "They are such bright, alert youngsters and did so well in high school that it is too bad they don't go to college."

Most high-school students do not go to college. Consequently, the teacher is interested in providing the best high-school education for pupils of all abilities.

We are interested in knowing what pupils in grade school will succeed in high school and what high-school students will succeed in college. To about the extent that correlation exists between I.Q. and ability in the academic subjects there is also a correlation between I.Q. and scholastic success in high school. This is entirely consistent, for scholastic success in high school is determined by success in the individual subjects. In general, there is a correlation of .40 to .50 between I.Q. and high-school achievement. About the same correlation exists between scores on college-aptitude tests and achievement in college. The college-aptitude tests, if they consist largely of vocabulary items or verbal elements, indicate better what a student will do in general academic courses than in, for example, the college of engineering or the college of dentistry. The school marks that have been obtained in high-school mathematics and science have been found to be a good indication of what a student will do in a college of engineering.

In fact, the marks that a student has earned in his high-school courses should be considered in connection with the results of the psychological examination in predicting probable success in college. High-school marks are a slightly better indication of what a student will do in college than is his standing in the psychological examination. The school marks that one has obtained show what one has done and therefore indicate what one is likely to do, though it must be borne in mind that standards of achievement are higher in college than in high school. Aptitude tests indicate what one should be able to do. Thus a combination of what one has done and what one can do provides a good basis for predicting what one will do.

Very few students who have a record of poor marks and who score low in aptitude tests succeed in college. On the other hand, as we should expect, those who have a very good high-school record and have a high rating on the psychological tests, with only a few exceptions, succeed in college. It is harder to predict for those who are high in one respect and low in another than for those who are consistently high or low in both their school marks or their mental-test standing.

On the other hand, if a high-school graduate is high in mental capacity, in other words, if he is a bright student but has achieved poorly and consequently received low marks, it is likely that his achievement will be no better in college. Possibly he may start utilizing his mental powers, but the likelihood is that he will have the same poor study habits and general indifference in college that he had in high school. A person's habits are very stubborn, and it is with discouraging infrequency that a student substitutes good study habits for the poor ones that he has had for many years.

However, if a high-school graduate, for example, has a very good record in high-school subjects but a psychological standing that is only average for high-school graduates, the likelihood is he will do well in college. One of the best woman students in a certain college had only an average mental rating according to high-school standards but a very good achievement record. She did not have top mental capacity, but she was very industrious. The cumulative learning resulting from her systematic efforts and her industry enabled her to achieve as well as the best students in the college.

It has been found through experience that boys who graduate from high school with a composite ranking in scholarship and psychological tests that places them in the lowest one-third of high-school graduates should hardly attempt college work, for very few succeed. Failure is almost certain for such students. In the case of girls, those in the

poorest one-fourth are also almost bound to fail. In other words, if a high-school graduate has low capacity for learning and a poor record of achievement, it is very unlikely that he will succeed in college.

At the other end of the range, those students who are in the best tenth, according to a combined ranking of their aptitude- or psychological-test and high-school marks, are almost certain to do satisfactory college work. Very few failures will occur among the students in this highest tenth. From the highest ranking high-school graduates to the lowest, the probability of success accompanies the rank, being best for the best rank and diminishing with a decrease in rank and being least for those with the poorest scholarship and aptitude standing. In other words, if we think of a scale on which the students are ranked from 0 to 100, the chances of success are greatest for those at 100 and least for those at 0, with the probability corresponding in general with the position along the scale.

Expectation According to Correlation of .40 and .50. It is difficult to visualize what is meant by *correlations*. We know that a correlation of .40 is larger than one of .20; and, in general, we judge the amount of correlation by the numerical size of the coefficient, although this is a gross and only an approximate way of doing it. This point will not be developed fully, but an idea of what correlations of .40 and .50 are will be explained by indicating what they mean in terms of prediction. Let us assume that we are trying to judge what high-school graduates will do in college if the correlation of combined high-school record and aptitude test with achievement in college is .50. Of those who are above the average on the basis of the combined rating of scholastic and aptitude tests, two-thirds will also be above the average in college, but one-third will be below. In other words, out of every 100 high-school students above the average according to this method, about 67 will be above the average in college, and about 33 will fall below. Correspondingly, of students going to college who are below the average for combined ratings of high-school marks and college aptitude, two-thirds will be below the average of college achievement, but one-third will change their position and be above. Thus, if one were predicting in relation to the average, he would be right twice as often as he would be wrong. If one predicted according to guess or chance, he would be right once to every time he was wrong; but prediction on a basis of a correlation of .50 results in a 2-to-1 ratio of correct prediction.

On the basis of a correlation of .40 the prediction is not so accurate. Of those in the upper half, 63 out of 100 will retain that general position; but 37 will fall below, the ratio being 63 to 37, or 1.7 to 1. For a correla-

tion of .50, the ratio was 2 to 1. According to a correlation of .40 between two traits or qualities, of those in the lower half in one trait, 63 out of 100 will be in the corresponding, or lower, half in the other trait, but 37 will be in the upper half. When the coefficient of correlation is smaller, the ratio of those in the corresponding half to those in the other half approaches 1, or 50 to 50, which is the case when the correlation is zero. As the correlations become larger, or approach 1.0, the ratio of the numbers in corresponding halves to those in the other halves approaches infinity, or 100 to 0. When the correlation is 1.0, all are found in corresponding halves; but when the correlation is zero, 50 per cent are found in corresponding halves and 50 per cent are not.

It may seem to the reader that excessive emphasis has been laid on the relationship between measured mental ability and high-school marks and probable success in college. Such would be the case if it were not for the fact that the principle explained in reference to those relationships also operates at every level of the school from kindergarten through college. The best index to what a child will do in the second grade is what he has done in the first, what he has done in the third grade indicates what he will do in the fourth, and what a person has done in his freshman year in high school is the best indication of what he will do in high school.

Correspondingly, when the mental capacity of a student has been measured, the teacher also has an indication of what the child can be expected to do in the various subjects. If the teacher has at hand what the pupil actually has done, he has additional help in predicting what the child will do. These principles apply to all grades or levels of the school, not only to the high-school graduate who goes to college.

Change of Standards from Kindergarten through College. Will a child who does good work in the lower grades do good work in high school and in college? This raises the problem of long-range prediction. No attempt will be made to answer the question here. Instead, it will be merely pointed that prediction must take into account that the average quality of students in high school is higher than that of grade-school pupils and that college students, in turn, average higher than high-school. The reason for the increase in intelligence according to school level is largely the retardation and dropping out of the less capable students. The more capable tend to survive and finish high school, and the most capable finish college. This is true only as a general principle, for some who are capable drop out before they reach or finish high school, and many who are mediocre complete their high-school work. The very poor do not finish high school, and comparatively few of the

mediocre finish college. Thus, those who finish high school are a more selected group than are those who finish grade school, and those who finish college are a more selected group than those who finish high school. College graduates, in turn, are more selected according to aptitude than are high-school graduates, and the most capable students of all are those who work for advanced degrees. Selection goes on all the way from the kindergarten to the doctor's degree.

An idea of the selection that takes place from the lowest step in the educational ladder to the highest is evident in the fact that the intelligence-test scores of Terman's gifted children when they were college students were slightly under the scores of candidates for the Ph.D. degree in psychology at Stanford University. Candidates for the Ph.D. degree probably represent the highest selection of students. The average score of the candidates for the Ph.D. degree at Stanford University was slightly above that of college students who were selected because of having an I.Q. of 140 or over, which represents a selection of about the best 1 in 400 or even more. It is thus apparent that from the kindergarten up through the graduate school to the highest degree, the Ph.D., only the very best survive. The competition gets harder and harder along the way, and only the very ablest, or a small percentage of those who started, are still in the running at the advanced graduate level.

We must hasten to point out that success in school is not to be measured alone by examinations, achievement tests, and school marks and also that a school must do much more than teach subject matter. The good school is efficient in making every student as successful scholastically as possible, but it is equally concerned, if not more so, about the child's health and the development of good personality and character so the child will be happy and successful in his human relationships. Furthermore, the good school does the most it can for every child of every mental level and is not concerned only with preparing children for the next academic step.

It is the selective character of education that helps to explain why some children who seem superior in the lower grades prove to be only average or slightly better in high school and probably poor or failures in college. For example, a first-grade child with an I.Q. a little over 100 and superior home advantages may, if earnest and diligent, do very good work in the grades. Such a child, if he possesses an I.Q. of 110 or 115, may seem to be the brightest child in his class. When this child reaches his last year in high school, there will probably be in his classes a few pupils considerably brighter than he. Especially is this true if the high-school classes are large—it is less true in the smaller high

schools. The pupil who seemed bright in high school will not be so outstanding in college. He may be only average or even less, for he will be competing with the best students from many high schools. The pupils' relative standing shifts as they proceed up the educational ladder, for the average intellectual quality increases.

I.Q. and School Level. Usually, it may be assumed that the average I.Q. of children in any of the lower grades is about 100. This varies, of course, in any grade or school, according to the socioeconomic status of the children's parents and other factors. If the average I.Q. of children in the lower grades is about 100, the level is a little higher in high school—probably about 105 or 110—for the poorest students do not go to high school. It must be recognized, however, that education is not so selective now as it was a few decades ago. More and more students are found in high school, many, because of the tremendous increase in enrollment, with lower I.Q.'s than formerly. College enrollments also have increased very much during the past two decades, and the consequence of these increases is that more of the less able students are also found in college. The best students in high school and college are as capable as were the best students decades ago, but more of the less able students survive than formerly. The point should also be made that financial ability to go to college is an important factor, and often financial ability, rather than mental ability and desire, determines whether or not a student goes to college.

Owing to the conditions indicated above, it is more difficult now to show what I.Q. is necessary for success in high school and in college than formerly. The high school has enlarged its curriculum and offers so many different types of courses that most students can now obtain a high-school diploma. Such an adjustment to individual differences is desirable, for the school serves the pupils; but it also means that high-school diplomas do not represent the same kind and quality of scholarship that they did years ago.

It is not the purpose of the schools to arrange the courses and offer a limited program so that the academically duller pupils drop out. The schools then serve only the brighter pupils. They should serve all the pupils, offering work suitable for children of all degrees of brightness, interest, and capacities.

Ordinarily, it is expected that high-school students should have I.Q.'s of at least 105 or 110 in order to grasp the content of most high-school subjects. Higher degrees of brightness are desirable, of course, and students with higher intelligence acquire a better comprehension

of their subject. It is doubtful, however, that children whose I.Q.'s are under 105 can understand adequately the use of symbols in algebra or the interpretation of the facts in history, acquire the vocabulary in Latin or the principles of physics, or comprehend the abstract and symbolic elements in most scholastic subjects. Still, they can profit from courses in citizenship, physical training, manual arts, music, commerce, or whatever they may have the ability and interest for. The student should be given profitable experiences, and the high school can furnish valuable educational training for all students.

The minimum I.Q. for satisfactory college work is higher—possibly 110 or 115. College students with less intelligence drop out in large numbers, although a few of them do creditable work because of their extraordinary industry. In order to be able really to comprehend college instruction, to integrate the subject matter acquired, and to react in a somewhat original way to it, a higher I.Q. is needed, possibly 125 or 130 and over. One cannot be too arbitrary about minimum I.Q.'s, for there are always the exceptions among those who are low down in the group but achieve surprisingly well in spite of a mediocre intellectual equipment. In general, however, it is well to recognize the limitations set by I.Q.'s of different size, but with a willingness to allow for exceptions.

A striking exception was the case of a boy with a low college aptitude who entered college. The aptitude tests that this young man took when he entered the senior division, or the upper 2 years of college, indicated that he was in the lowest 5 per cent of all students who entered. It was predicted by those who did not know him that it was futile for him to try to obtain a college degree. "He might just as well go back home and not even begin his courses," said an instructor who observed his standing.

Those who knew his school history stated that he had a good high-school record, that he had done well in junior college, and that he had characteristics and capacities that the aptitude tests do not measure. On the basis of past performance, it was predicted by those who knew him that he would do acceptable work during his junior and senior years.

The boy did do passing work. In fact, it was strong average. Conversation with him near the time of graduation revealed that he was disappointed because his marks were not high enough to earn him a place on the honor roll. He had tried very hard for this but apparently he could by studying very diligently and systematically succeed only

in passing his courses satisfactorily; with his limited aptitude, even his most earnest attempts to achieve superior standing resulted in failure to do so.

Ordinarily, it is said of students of this type that they are hard "pluggers" and will do passing work but that nothing creative or original can be expected of them. The boy we have spoken of exceeded all expectations in this regard, also. Shortly after he graduated from college, he took out a patent on an invention. His invention did not alter appreciably the way we live, but it represented a degree of creativeness not found in many with much higher I.Q.'s.

This case, of course, is an exception and must be so regarded. Most students with the aptitude rating of the boy described above fail. A few exceptions should not cause us to overlook the general trend or relationship between aptitude and school achievement. However, we should be on the lookout for exceptions and remember that none of life's activities can be reduced to a formula.

Table 4 shows the relationship of intelligence quotient and school progress. It presents the results of a follow-up study of 1,989 pupils who were tested in the sixth grade, so that the I.Q.'s reported are those determined in the sixth grade. An interesting fact is that no person with an I.Q. under 97 received a bachelor's degree and no one with an I.Q. under 111 took graduate work.

TABLE 4. INTELLIGENCE QUOTIENTS OF SIXTH-GRADERS AND SUBSEQUENT SCHOOL PROGRESS*†

	Did not enter high school	Entered high school but did not graduate	Graduated from high school but did not enter college	Entered college but did not receive degree	Received bachelor's degree	Took graduate work or received advanced degree
N	270	590	523	171	99	27
%	16	35	31	10	6	2
Q ₁	88	97	106	107	114	118
Md	95	105	114	115	123	124
Q ₃	102	112	121	124	131	134

* Adapted from data reported by Viola E. Benson, in an article, *The Intelligence and Later Scholastic Success of Sixth-grade Pupils*, *School and Society*, 55: 163-167, 1942.

† N = number, % = per cent. Q₁ is the 25th percentile, or the position or score below which 25 per cent of the I.Q.'s are found and above which there are 75 per cent of the I.Q.'s. Md is the median, or the I.Q. below which half are located and above which are the other half of the I.Q.'s. Q₃ is the 75th percentile, or the I.Q. below which 75 per cent of the I.Q.'s are located and above 25 per cent are found.

In reading this table observe that those students who progressed further in school had the higher I.Q.'s; this is shown for Q₁, Md, and Q₃. Note that the median I.Q. of the sixth-grade pupils who did not enter high school was 95 but that the median I.Q. of those who did graduate work was 124.

I.Q. and School Subjects. Some subjects require more of the ability measured by aptitude tests than do others. These are the ones more academic in nature. In the elementary school, as has been stated, reading, arithmetic, history, geography, language, and grammar call for the abilities measured by general mental tests to a greater extent than do art, writing, or music. In high school the more academic subjects such as Latin, algebra, geometry, English, history, French, and physics require more of the abstract type of intelligence than do the commercial and vocational subjects. Thus it is discovered that students taking Latin and those who select an extra unit of mathematics, for instance, are brighter than those who specialize in agriculture, sewing, cooking, typewriting, bookkeeping, or manual training. The I.Q.'s of students taking these latter courses may be 10 or 15 points lower than those taking the classical, scientific, or general subjects. The various types of courses attract students of different abilities.

Sometimes teachers attribute the greater mental ability of the students in their courses to the training value of the subject itself. For example, when a Latin teacher in a high school of 160 pupils discovered that her students had the highest mental ability, she pointed out to her superintendent what she thought was the effect that the study of Latin had on their mentality. The true reason for the superiority of the Latin students is that Latin is chosen by students who have more of the ability that the mental tests measure. Students who take Latin tend to come from homes in which the parents have had an academic education and who plan that their children shall go to college. Furthermore, the weaker students are not encouraged to take Latin. The consequence of these factors is that the better students are found in the Latin classes.

In trying to anticipate who will succeed in school the teacher should take cognizance of the change of standards, previously mentioned, that occurs from kindergarten up through the graduate school, because of the dropping out of school of the weaker students and the survival of the stronger. Thus, a child may have more than adequate ability for the first grade, but not for high school or college. The quality of the student body becomes more select and improves from year to year, making competition at different levels increasingly difficult for all students; only the better ones succeed in high school and, more especially, in college.

It should not be overlooked, however, that students have special interests and abilities. Those not so able in general academic work may be better in music, art, vocational subjects, physical education, and other studies more specialized in nature. Boys and girls of school age should

be in the controlled environment of the school, having social experiences and getting whatever training from which they can profit.

It is not implied for a moment that a high order of abstract or general intelligence is not needed if a student is to excel in music, art, industrial courses, business, and physical education. Only the bright excel in all phases of such work, but there is much of this work that calls for specialized ability not measured by general-intelligence tests. Because of the lower correlation with intelligence of the abilities needed in these special courses, it is possible to do well in them without being able to do very well in algebra, geometry, Latin, physics, and other academic courses.

To be a leader in any of these special fields, however, a high order of general intelligence is needed. Evidence pointing in this direction can be found in colleges where there are special departments in music, art, industrial training, and other subjects. Let us take music, for example. In colleges and universities having strong music departments, it will be found that the music students are equal on the average to the students of the departments ordinarily attracting the best students. It is only in colleges maintaining average or poor music departments that the music students tend to be only average or below average in general capacity and general academic abilities.

University Departments and Measured Aptitude. The average mental aptitude of students in various university departments and colleges also differs. Generally, graduate students have decidedly the highest average aptitudes. Engineering, law, and medical students usually test high, also. These students are ordinarily well selected, for the courses require a high order of academic or abstract ability, which is the ability measured most adequately by the aptitude tests. Students in music schools, agricultural departments, home-economics courses, and schools of dentistry tend to have the lowest mental ability of the kind that aptitude tests measure. This is not surprising. Students are in a music school because of their musical talents first and their academic abilities second. Although the training of a dentist involves a considerable amount of content or book materials, much of his success depends on skill and dexterity with his hands and with tools. Thus, dental students are selected in part on the basis of abilities other than those measured by aptitude tests. Students in the colleges and departments mentioned do not have such high psychological test abilities on the average as those in other departments; yet they probably have higher special abilities and interests than academic or scientific students. Nevertheless, they would be better students and would rank higher in their chosen profession if their academic aptitudes were higher. It

should be added, in order to avoid misunderstanding, that we have been speaking in terms of averages. On the basis of academic measurements, there are brilliant and exceptional students in any department or school and consequently graduates of the same caliber in all professions and vocations.

Differences in Capacities of Students in Different Schools. The average capacity of school children in any large school system differs from school to school. The mental-test scores of the children of a school in one section of a city may be distinctly higher or lower than those of a school in a different section.

Figure 13 shows the differences in the mental abilities of the children in a number of schools. It indicates the variation among 64 schools in mental-test scores according to the percentage of each school above and below the limits of the middle 50 per cent of all 6A children. For purposes of illustration, we may single out schools 37 and 45. About 57 per cent of school 37 and 0 per cent of school 45 are above the upper limit of the middle half of all 6A pupils of all the schools. Those above this limit are at least equal to the best one-fourth of all students. Below the middle half the percentages are very different for the two schools. Only about 14 per cent of the pupils in school 37 are below the middle half and may be classified with the poorest one-fourth of all pupils, but about 75 per cent of school 45 are in that category. The status of the other schools can be interpreted similarly.

The schools with the children whose measured aptitude is higher are situated in good residential districts. Most of the parents are successful professional and business people, and their socioeconomic status is high. Their families tend to be small or moderate in size. The children of this district have had the advantage of a better home environment and also have no doubt inherited better intellects.

The school with children of lowest mental aptitude is situated in what is generally described as a district of poor homes. The fathers of the children in this school are unskilled or semiskilled laborers, and unemployment is common among them. Their socioeconomic status is low, and the cultural and educational influences of the home environment are meager. Furthermore, it is likely that the hereditary endowments of many children in these areas are also below average.

The teachers in the school situated in the more favored district will find that their children are above the city norms or medians of achievement tests for various subjects, whereas the teachers in the school located in the less favored district will discover that their children are below the city medians. The latter teachers may try as hard as they

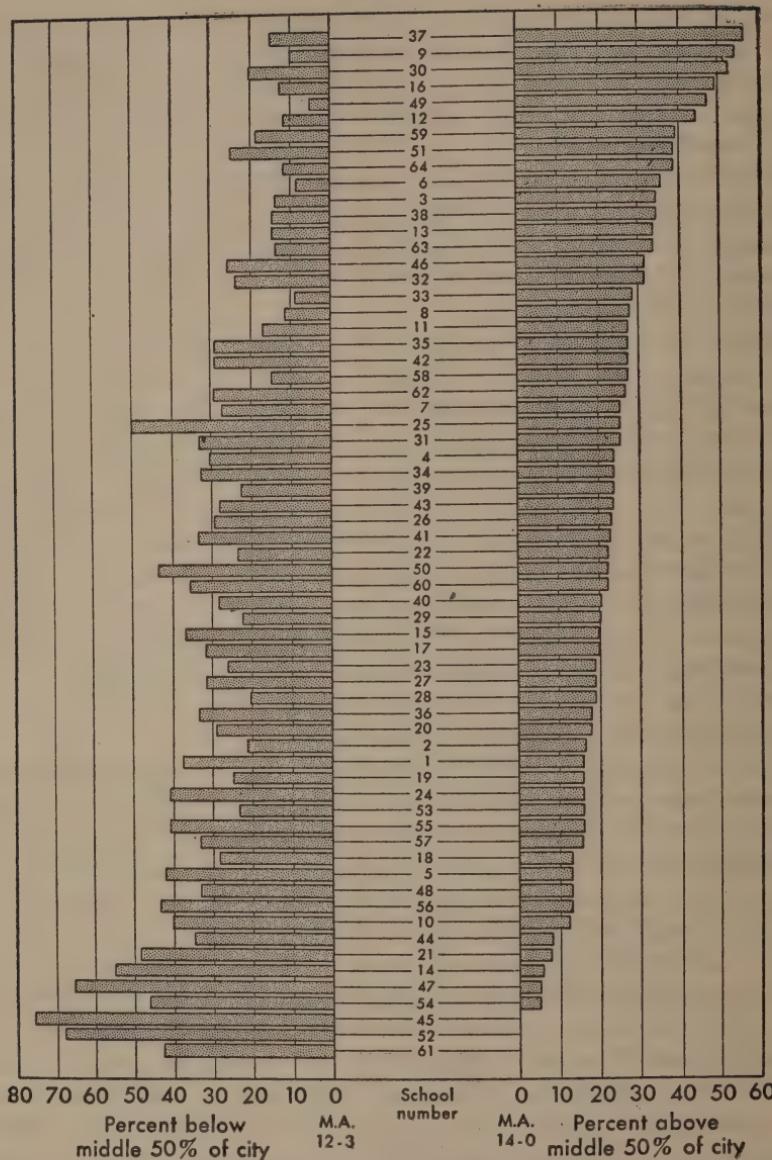


FIG. 13. Variation on Delta 2 test among 1,989 6A pupils of 64 schools. (From W. S. Miller, *The Classification of 6A Pupils into Ability Groups*, Proceedings of the Minnesota Society for the Study of Education, 1924, p. 21.)

can, but it is doubtful that their pupils will, on the average, reach the city norms. It is very difficult for the teachers in school 45 to bring their children's performance up to the city medians and practically impossible

to bring it up to the levels of performance of school 37. The latter is almost certain to be above the city norms no matter how poor the teaching. Some supervisors may commend the one school for its fine achievement and point out to the other that it is not up to standard. If, however, the average mental ability of the schools is taken into account, no one should expect the poorer school to come up to the average achievement.

Variation in the quality of the student body may also characterize the schools within the county or state and the nation. Children vary with areas, which, because of social and economic conditions, attract a superior type of people or a poorer type as the case may be. In suburban and residential areas, for example, the quality of the students is likely to be high, whereas in mountainous, cutover, or congested slum areas the quality is likely to be lower. The socioeconomic status of an area is a general index to the general mental abilities of the students from that area.

Variation among Classes of the Same School. The quality of the student bodies of even the same school may differ from year to year. It may happen that during a given year the quality of a class may be higher or lower than it was the previous year; this is especially true if the enrollments are small. This point was brought out when the supervisor from the state department of education was visiting a small village school. He called the attention of the superintendent to the fact that not so many high-school students passed the state examinations as formerly, implying that the teaching had become poorer. The superintendent, however, showed the state inspector the results of the mental testing that had been done annually for a number of years. The results indicated how the mental capacities of the classes varied from year to year. The superintendent pointed out that, in schools with small enrollments, comparatively large increases or decreases in the proportion of duller or brighter pupils occur from year to year and the proportion of failures is apt to vary accordingly. He added, in his explanation of the increased number of failures, that the effectiveness of instruction or the instructional standards of a school cannot be judged on the basis of the number who fail in the state examinations without taking into account the mental capacities of the pupils. The argument given by this superintendent of schools is a valid one.

The variation found from school to school within a large city or from village to village is also found in various colleges throughout the land. Large differences exist in the qualities of students. In some colleges the best quarter of the students are equal only to the poorest quarter of other colleges. This means that in some colleges essentially all the

students are equal or superior to the best one-fourth of the students in other colleges where the average mentality is low.

In spite of such facts, colleges whose students are so different in their abilities are similarly accredited and give the same degree. The degree cannot, under such conditions, represent the same levels of achievement. In fact, good scholarship in the colleges with the poorer students might be considered failure or, at best, just passing in the colleges that attract the best students. These statements apply particularly to colleges with student bodies which are extremely poor or extremely good, intellectually, but they are applicable in lesser degrees to those colleges in which the differences are not so great. Even though colleges differ in the quality of their student bodies, ordinarily the best students of most colleges are very capable and make satisfactory graduate students in almost any university. Furthermore, every college has some graduates who have become leading citizens in their communities.

SUMMARY AND REVIEW

A child entering school should be tested with an individual mental examination and probably with a reading-readiness test. Such tests and the processes of testing yield very valuable information about the mental capacity and personality of the child.

The usual general-intelligence tests indicate better what a student will do in the academic subjects and less well what he will do in commercial, vocational, and special subjects.

In general, children of higher intelligence go to school the largest number of years, while those of least intelligence drop out of school earliest. There are individual exceptions, of course, but this is the trend from the first grade through high school.

A student's record in one grade is the most reliable indication of what he will do in the next grade.

Most correlations between intelligence-test scores and school marks or achievement are .40 and .50. This means that 63 and 67 per cent will be in their corresponding halves, respectively, in intelligence and achievement.

Because the work becomes harder and because the duller children drop out of school, the standards rise with each successive step in the educational ladder—elementary school, junior high school, senior high school, junior college, senior college, and graduate school.

Students in high school who elect subjects like Latin and mathematics have on the average higher intelligence than the student body

at large, while students who specialize in vocational and commercial subjects tend not to be so high.

There are differences in universities, too. Students majoring in law, medicine, and engineering tend to be higher than those majoring in dentistry, pharmacy, home economics, music, and art.

The student bodies of different colleges and universities differ greatly in their average capacities, and there is a great range between the best and the poorest.

The schools of any large school system vary greatly in the quality of their student populations. The differences accompany the socio-economic levels of the areas in which the schools are situated.

In small schools the individual classes may differ in their quality from year to year.

Test Your Thinking

1. Much is said about reading readiness, arithmetic readiness, and readiness in general. Explain what is meant by readiness.

2. How do the results of intelligence tests, M.A., and I.Q. help a teacher predict what a pupil will do and explain what a pupil is doing?

3. A high-school principal said, "Let me see a high-school student's scholarship standing in his class and also his standing in the intelligence tests, and I can tell you whether or not he should go to college and predict his likelihood of succeeding." Comment.

4. Trace in general the average level of intelligence of students in the various divisions of the educational system from the kindergarten through the graduate school.

5. An old and persistent argument in favor of education is the evidence to the effect that high-school graduates earn more than eighth-grade graduates and college graduates earn more than high-school graduates. Can you show that years of schooling alone are not the cause of increased earnings but that certain selective factors are also very important, probably more so? Comment.

6. Subjects in high school and college attract students who vary on the average in their mental abilities and capacities. Discuss.

7. Let us drive our car through a city and notice how sections vary in socioeconomic status as shown by the homes and buildings. There will be a range from slums to fine residential sections. The schools attended by the children from the poorer sections will have more dull pupils and fewer bright ones than those attended by children from the best sections, and the average abilities will tend to correspond with the socioeconomic status of the communities in which the schools are located. Discuss.

References

- ADAMS, F. J.: College Degrees and Elementary-school Intelligence Quotients, *Journal of Educational Psychology*, 31 : 360-368, 1940.

- BENSON, VIOLA E.: The Intelligence and Later Scholastic Success of Sixth-grade Pupils, *School and Society*, **55**: 163-167, 1942.
- COFFEY, W. C., JR.: The Mortality and Academic Careers of Two Groups of College Students, *School and Society*, **52**: 269-271, 1940.
- COMPTON, R. K.: Student Evaluation of Knowing College Aptitude Test Score, *Journal of Educational Psychology*, **32**: 656-664, 1941.
- DEAN, CHARLES D.: Predicting First-grade Reading Achievement, *Elementary School Journal*, **39**: 609-616, 1939.
- FREEMAN, F. N.: *Mental Tests*, Houghton Mifflin Company, Boston, 1939.
- GATES, ARTHUR T., and DAVID H. RUSSEL: The Effects of Delaying Beginning Reading a Half Year in the Case of Underprivileged Pupils with I.Q.'s 75-95, *Journal of Educational Research*, **32**: 321-328, 1939.
- JOHNSON, H. G.: I.Q. Skullduggery, *School and Society*, **57**: 269-271, 1943.
- MILLER, W. S.: *The Classification of 6A Pupils into Ability Groups*, Proceedings of the Minnesota Society for the Study of Education, 1924.
- STODDARD, GEORGE D.: *The Meaning of Intelligence*, The Macmillan Company, New York, 1943.
- THURSTONE, L. L., THELMA GWINN THURSTONE, and DOROTHY C. ADKINS: The 1938 Psychological Examination, *Educational Record*, **20**: 263-300, 1939.
- TRAXLER, ARTHUR E.: *Techniques of Guidance*, Harper & Brothers, New York, 1945.

CHAPTER XI

ADJUSTMENT TO INDIVIDUAL DIFFERENCES IN INTELLIGENCE

What to Look For. Observe that, in this chapter, stress is laid on the great differences in the capacities and abilities of children of any given age and grade.

Learn how homogeneous grouping is an attempt to organize the pupils for more effective teaching.

Note how, in the case of some very bright pupils, their achievement as measured by tests is high while their marks are low.

When ability grouping is used, what adjustment should be made for pupils who are considerably better in some subjects than in others?

If ability grouping is to be effective, how must instruction be adapted to the various groups?

Try to understand the characteristics of individualized instruction.

What are the principles that underlie individualized teaching?

Note what is said about the all-round development of man and also what is said about the development of strong "suits."

Learn what may be the ill effects of too much extra promotion.

Be able to explain the meaning of the much-used term *enrichment*.

Observe how the Dalton plan is an adjustment to individual differences.

Introduction. "The hardest problem for the teacher, it seems to me," said Mrs. Jones, mother of three school children, "is to appeal to the widely differing tastes, interests, and capacities that are found in a roomful of children."

Mrs. Nelson, another mother, replied that she had heard the school psychologist say that in the sixth grade, for example, the dullest children can learn no more easily than can some third-graders and that the brightest sixth-graders can learn more readily than can some high-school freshmen.

Except for those with very low I.Q.'s, children of all mental abilities are found in the schoolroom. The children who enter the first grade at the age of six are heterogeneous in ability. A first-grade child with an M.A. of 4 may be sitting next to one with an M.A. of 8. They

are given the same assignments and are required and expected to do the same work.

In previous years, and to some extent today, the process that resulted in more homogeneity of ability in the class was the promotion of the bright pupils and the retardation of the dull. Some children remained in the same grade 3 or 4 years. As a result, those who reached the upper grades were considerably more homogeneous in their capacity to profit from instruction than the first-grade children had been.

Now the policy of many schools is not to fail children so frequently as formerly. As a consequence, the dull children are promoted regularly, and when they reach the intermediate and upper grades they are comparatively even less competent to do the work than they were in the first grade. Figuratively speaking, the work in subsequent grades grows farther and farther away from their reach. But no matter what the promotional policy, the instructional problems because of individual differences always exist.

Homogeneous Grouping. Attempts to divide children into homogeneous groups are not new. In fact, it has been attempted as long as we have had group instruction. Our present system of organizing children into grades—first, second, third, etc.—is an attempt to classify them according to their ability to learn. One should ask if the present grade system based on chronological age is the best. It has some advantages, but it also has many weaknesses. Children of the same C.A. differ in physical size, in ability to adjust socially, in I.Q., in M.A., and in the capacity to comprehend the instruction that they receive. For instance, they differ so much in achievement from grade to grade that some fourth-graders have more skills and knowledge than some eighth-graders, and there are first- and second-graders who exceed a few of the fourth-graders. The achievement of the best one-fourth of any grade is distinctly better than that of the poorest one-fourth of any grade next above it; and among the upper grades of a school the achievement of the best one-fourth of the pupils is better than that of even the poorest one-fourth of the class two grades above it. Thus, if the best one-fourth of the sixth grade replaced the poorest one-fourth of the eighth grade, the quality of the eighth grade would be improved and become more uniform.

By applying our knowledge of individual differences and using intelligence and achievement tests, we should be able to grade, or group, pupils more effectively than we do now. It is clear that when pupils are grouped according to C.A. there is marked heterogeneity in their social maturity and their ability to profit from instruction.

If children are to be classified according to ability, what ability or abilities should be rated as of major importance? Possibly the capacity for learning as indicated by I.Q. and M.A. should be regarded as a very important one. Teachers' marks, with all their inaccuracy, do indicate in a general way just how effectively a pupil achieves and what a child has done, and I.Q. and M.A. indicate reasonably well what a child can do. Standardized achievement tests likewise indicate how well a child has achieved and also indicate how well he will achieve in the future. It may be well to consider first the methods of classification based on these measures before others are taken into account.

Children of essentially the same I.Q. and M.A. may be put into the same class or group. They will have about the same degree of brightness and the same mental level. In addition, they will be of about the same age, also, for if they are similar in I.Q. and M.A. they will be similar in C.A. In fact, the way to make sure that the children in a group will be homogeneous in M.A. is to select those of the same C.A. and same I.Q. It is, of course, impossible in the practical situation to choose children of exactly the same I.Q. Because I.Q.'s range continuously from low to high, it is a good practice to group those between given points. For example, children eleven and twelve years old with I.Q.'s between 90 and 110 can be put in one group. To select from within this range the brighter younger child and the less bright older child and group them together is desirable. Thus, a twelve-year-old child with an I.Q. of 100 will fit fairly well in a group with an eleven-year-old child with an I.Q. of 110, for both have an M.A. of about 12. There will always be some variation within any group selected for homogeneity, but a small range is allowable.

Accordingly, children of a given age can be divided into two or more groups. Practical considerations, such as the number of pupils to be classified, may govern the number of groups. They might be divided into as few as two or as many as five or six groups.

Theoretically, pupils classified into groups so that they are fairly uniform in I.Q. and M.A., and thus in C.A. also, should be able to learn with about equal facility. They should grasp directions and explanations at about the same rate, and their intellectual progress should be nearly uniform.

Achievement and Capacity. This classification in terms of mental and learning capacity also tends to bring together in the same classes children of the same social and physical development. Being of the same or more nearly the same chronological and mental age, the children are likely to be much more alike in social interests as well as in

interests in games and sports. It should always be kept in mind that the class is a social unit as well as a group organized for learning subject matter.

The achievement that ought to take place in terms of capacity does not always do so. Even though groups are fairly homogeneous in brightness and mental maturity and are much alike in their ability to perceive and comprehend, there will still be some able children whose achievements are far below their capacity for achievement and duller children who do much better than expected. Students of average capacity are more likely to vary both above and below what is expected. Of course, many children achieve at a level consistent with their capacity.

In view of the fact that actual achievement does not always correspond to the capacity to comprehend, the question may be raised whether or not children should be transferred to other groups according to their achievement. Thus, should a student who achieves high for his capacity be shifted to a higher or abler group, and should one who achieves poorly in terms of his capacity be transferred to a group of pupils whose aptitudes are lower?

In determining actual achievement, it is well to check or validate the teachers' marks against comprehensive achievement tests. It may be found when tested by standard achievement tests that a dull child getting fairly good marks really does not have the knowledge to justify these marks and that a bright child really has more knowledge than most of his classmates and still has been receiving only average or poorer marks.

We can illustrate further with the case of John P., a bright boy with an I.Q. of 146, who was in the sixth grade of a large junior high school. Most of his marks were C or average, but he did receive some D's and an occasional F. When measured by standardized achievement tests, however, it was discovered that his achievement was three to four grades above his grade placement. In the school that he attended, he was placed in the group of average ability because of achievement. In addition to being unsatisfactory in achievement as judged by the teacher, he was also a behavior problem.

But, in spite of his marks, he should have been placed in the brightest group. His brightness and his powers of comprehension fitted him for that group. It is doubtful that his work would have become any better in the poorer group, for he would be unlikely to prepare the required papers or lessons any more adequately than formerly or to show any more interest in recitations. In fact, he was placed in a remedial section, an unforgivable educational sin, and he did more poorly than ever, for

he was bored by drill and repetition. If he had been placed in a class where the teaching was at a level that stimulated bright children to react, he might have developed an interest in the class material.

Faulty placement affected not only his marks but his personal adjustment, and his behavior tendencies became more serious. This increasing maladjustment was to be expected as long as he, a boy with an I.Q. of 146, remained in a group where the instruction was directed toward pupils with I.Q.'s of 100 and where his companions—possibly his teacher, also—were intellectually inferior to him. If he had been placed in the brightest group, the likelihood is that he would have made a better adjustment, especially if the teacher of this group were bright and had adapted the curriculum and her teaching to the capacity of her students.

This point can be illustrated further by the case of a high-school girl with an I.Q. of about 160 who got A in everything but mathematics. In both algebra and geometry she received only C, though in fact she was probably more capable in mathematics than in any of her other subjects. She was exceedingly alert in comprehending the problems, in making original applications, and in reaching the answer in her own way. But her teachers were the routine, unimaginative kind, and as a consequence this bright student lost interest and was satisfied to "get by." A student like this should be in the ablest group in mathematics even though her marks are only average. Conversely, a dull child achieving average should probably be kept in the dull group, where instruction is geared to his capacity to comprehend. If, however, a child in the dull group has excellent achievement, he should be tested again, for it may be found that he has been incorrectly classified. He probably should be placed in an abler group and kept there if his achievement continues to be excellent.

Ability Grouping and Specific Subjects. If students are classified on the basis of I.Q. and C.A., and thus incidentally M.A. also, they are classified according to their general mental capacity. It will be found that students classified into different groups on this general basis are not uniform in their ability to learn the various school subjects. A few in the brightest group, for example, may not be so apt in arithmetic as in the other subjects. They might profit more by the instructional methods used in another group, where the general intelligence is not so high. Similarly for other subjects. Children of average or lower groups who have a special ability that enables them to be particularly strong in a given subject might profit by taking instruction in their strong subject with a brighter group. Assigning pupils from one ability section

to another for specific subjects will not be necessary in very many cases, for, in general, their abilities in the academic subjects are reasonably uniform—that is, they tend to achieve in all of them at about the same level.

Abilities for such special subjects as art, music, and physical education do not correspond so closely to the general mental level as do those for academic subjects. Thus, homogeneous grouping by I.Q. does not classify the students so effectively for the special subjects as for the general academic ones; however, it is somewhat better, even for these special abilities, than no classification at all.

There are many schools where it is almost impossible to classify the students according to their measured mental abilities. This is especially true in many small schools where the pupils are so few that it is impracticable to divide them into ability groups. In rural schools, however, where the enrollments are comparatively small but all eight grades are included, effective reclassification into fewer and more homogeneous groups or grades can be achieved by the use of general intelligence and comprehensive achievement tests. In other instances, where it is unworkable to classify children into ability groups, adjustment to differences in capacity can be made by adapting the methods of instruction to the capacities of the pupils.

ADAPTATION OF INSTRUCTION

Out of the extensive testing of abilities has emerged a sharpened interest in individual differences in capacities and abilities of people. This interest has taken practical form in the school in attempts to adjust instruction to differences in capacities and abilities. Various methods have always been used, such as individual attention after school, special homework, summer school, tutoring, remedial work, and extra promotion. A method that has been a more direct outgrowth of psychological testing has been the classifying of pupils so that they can be taught according to their capacities to learn.

Ability Grouping and Suitable Instruction. Ability grouping should be a means for bringing about effective instruction for children of all abilities. Obviously, in a heterogeneous group, instruction directed to the dull is not suitable for the average and the bright, and instruction suitable for the bright is not adapted to the average and dull. Consequently, when children are classified into ability groups, the content of the courses and the method of instruction should be adapted to their learning capacities. Bright children need much less drill and will respond to teaching that leads them to interpret and relate what they learn.

They will profit from a method permitting them to work independently, exercising their own initiative and originality, and a method causing them to integrate larger portions of their knowledge than they can if the classroom method is merely the question-and-answer type.

Children of less aptitude need more direct help from the teacher. Though deadening to the bright pupils, drill, frequent reviews, and frequent testing are more effective for the dull. The degree to which the teachers adjust their teaching methods depends, of course, on the degree of dullness of their pupils and the nature of the subject matter. There are, for instance, phases in the teaching of arithmetic that require more drill and review than is necessary in history or geography. Or, again, there may be more need for intensive work in teaching a subject in its initial stages than is necessary later on.

Teachers, supervisors, principals, and superintendents must do their part to make instruction with ability grouping most effective. There is no point in classifying children according to their general aptitudes if educators do not plan beforehand how they will adjust their methods of instruction and the curricula to the characteristics of the groups. Once the plan is put into operation, changes and adjustments may be made as the need arises.

It is important to select teachers according to their abilities to teach the children of the various ability groups. Some teachers are best fitted for dull children and work patiently and effectively with them. Others have the imaginative quality, sweep of mind, and special capacity for stimulating bright children.

An example of good classification but poor subsequent control is to be found in a junior high school of over 1,000 pupils where the children were classified into five ability groups on the basis of I.Q. and M.A. The classification was worked out by the school psychologist, after which the principal assigned the teachers to the respective groups. The teachers followed the course of study as before and taught much as they had previously, except in those cases where circumstances forced them to make some adjustments. The teachers of the brightest groups found it easy to cover the material, and the achievement of their pupils was high. But those who had the poor group labored hard to cover the course of study for their grade, and the achievement of their pupils was low. Many of the teachers in this school, and the principal also, were not satisfied with ability grouping and felt that the former heterogeneous classification was probably just as satisfactory and saved the work of organizing the students into homogeneous groups.

In this instance, it was not the principle of homogeneous grouping

that was at fault but the psychologist, the principal, and the teachers, who failed to function according to the opportunities offered by ability grouping. In the first place, the psychologist should have explained to the principal and teachers just how the children had been grouped and just what this grouping implied as to teaching methods and curricular changes. After this had been done, the principal should have taken charge in planning with the teachers and the psychologist how the curricular content could be adapted to fit the aptitude of the different groups. Furthermore, the problem of teaching methods should have been taken up, perhaps concurrently with the discussion of the curriculum. Then the teachers would have been ready to make the most of the situation after they had begun their work with the different ability groups.

Even when ability grouping has once been established, continuous study of the arrangement should be maintained so that beneficial adjustments can be made. Some pupils will probably have to be transferred from one group to another, and no doubt some of the teachers should be shifted so that they will teach the groups for which they are best adapted. The teachers of the bright groups will be faced with the problem of having enough books, references, and materials for enriching the curriculum. The teachers of the dull also need special materials. Only if an experimental attitude is maintained and adjustments are made as the need arises can the effectiveness of ability grouping be truly determined.

The Results of Ability Grouping. It is difficult to evaluate the effects of ability grouping, for it has been given few adequate trials according to the principles just set forth. The main purpose of ability grouping, as indicated above, is to give an opportunity for adjusting teaching methods and curricular content to the differences in children's aptitude for learning. As this purpose has not yet generally been realized, it is difficult to draw any conclusions. The most we can say at present is that there is some evidence that children tend to achieve better in homogeneous groups.

This fact is probably important, but it is even more important to know what effect ability grouping has on the personality of children. Are they better adjusted when segregated into fairly homogeneous groups, or do personality difficulties arise from such a classification? Theoretically, they should be better adjusted. When children are grouped so that they are faced with tasks commensurate with their capacities and when they are in a classroom with fellow students neither much poorer nor much better than they, they are not hopelessly out-

classed by their fellows, defeated by too difficult tasks, or dulled by too easy ones. The effect of ability grouping on the mental health of pupils is not known, but attempts should be made to discover and evaluate it.

Analysis of some studies indicates that probably there are, on the whole, slightly superior achievements and better personal adjustments in the ability groups. It must be admitted, however, that the evidence is far from adequate.

That we do not have adequate evaluations of the effectiveness of homogeneous grouping is a good reason for giving it a thorough trial. There is apparently virtue enough in the plan to warrant its being carefully tested. Ability grouping is not new, having been practiced, nominally at least, in many schools since shortly after the introduction of group mental tests. A natural consequence of the mental testing of children was to classify them according to ability. But because of practical difficulties the practice is less common in the smaller schools. In schools with enrollments over 250, homogeneous grouping is practiced much more extensively. About three-fourths of the schools the country over having over 500 pupils practice ability grouping.

Considerable discussion has been devoted to ability grouping, but the reader should not interpret the discussion as necessarily an argument for ability grouping. There has always been some form of grading and grouping of pupils, and obviously there should be. If intelligence and educational tests can help the teacher group the pupils so that they can be taught better and so that the pupils will develop better socially and personally, such tests should be used for that purpose. But out of this discussion of ability grouping should come a consciousness of the necessity for recognizing individual differences. Even without any ability grouping whatever, if the teacher is conscious of the great differences in the abilities of her pupils, she can understand them better and do much more for them.

Individualized Instruction. Some schools may use a method of teaching that enables the pupils to learn at their own individual rate. This system requires specially prepared instructional and test materials. The instructional materials are arranged in units so that the child can master the contents with a minimum of help from the teacher. Accompanying the study materials are self-testing exercises, which enable the pupil to determine how well he has mastered the part of the subject that he has studied. When he has reached a satisfactory standard of efficiency as determined by examination covering a unit of work, he is permitted to begin another unit.

The progress of pupils under this plan is influenced by their industry and learning ability. In addition, the individual pupil can adjust his program of study according to his abilities to progress in the different subjects. A pupil who finds himself better in one subject than another may strengthen himself in his weaker subjects by spending more time on them and less time on his strong subjects. A young pupil in a school in Winnetka, Ill., where the individualized system is practiced, said, "I don't have to spend much time on reading. I can read a page by just glancing at it, but I'm not so good in arithmetic, and therefore I put more time on it."

The individualized method of instruction tends to emphasize the acquisition of the basic facts and skills in various subjects. It is doubtful that the pupil by this system alone gets adequate opportunity to apply these facts and skills to life situations, as he might if he were learning through activities or in a socialized situation. At Winnetka, however, half the day is spent in socialized activities and the other half in individualized work. Groups of children engage in pageants and plays, group singing, excursions, the arts, handicrafts, and creative writing. In addition, the students have their own government, which also operates to socialize pupils. By means of such a combined program the children have an opportunity to relate their information to group living.

Differences in the Individual. Even though each individual in a broad way tends to be uniformly endowed, he is stronger in one respect than another. He may have greater ability in one academic subject than another, or he may have special talents for or interests in mechanics, art, or music. The question arises, therefore, whether one should spend more time on his weak subjects in order to bring his achievement in them up to average or should develop his strongest subjects at the expense or at least a partial neglect of his weaker subjects.

For the most part, teachers practice the method of drilling the pupils on their weak subjects. If a pupil is especially strong in history and weak in arithmetic, he is directed to spend more time on arithmetic and less on history. There are good grounds for questioning this procedure; a pupil probably should not neglect his strength in order to cultivate his weaknesses. If a student has a special interest in a subject because he has more ability in it than in others, he should work at it more rather than less. The teacher and librarian should provide him with more books in the field and be alert in calling his attention to lectures, motion pictures, exhibits, and other opportunities for sharpening

his interests, widening his knowledge, and developing his critical attitude toward the fields of his special ability.

Much extra time devoted to the pupil's weaknesses is probably not well spent. The extra time is better used if spent on the subject or subjects of his greatest interest, for thus he may develop a proficiency in a field of study that he will pursue all his life. It is better to develop children and adults so that they are especially strong in some fields of knowledge and comparatively weak in others rather than uniformly mediocre in all. This point of view should be interpreted in general to apply to larger areas of ability and not to specific weaknesses within a given subject. If, for example, a pupil is weak in certain basic steps in arithmetic, then drill should be centered on that weakness and not on the steps that have been mastered. On the other hand, if there are some pupils particularly good in the manual arts and mediocre and uninterested in a few required academic subjects, then emphasis should not be placed on learning those subjects to the partial neglect of the nonacademic subjects in which he is interested. If there are subjects for which pupils have an aptitude, schools should never be too arbitrary about requiring subjects that, for some pupils, are overdressing.

A quotation from Dolbear will illustrate the evils in a system for uniform development.

In Antediluvian times, while the animal kingdom was being differentiated into swimmers, climbers, runners, and fliers, there was a school for the development of the animal.

The theory of the school was that the best animals should be able to do one thing as well as another.

If an animal had short legs and good wings, attention should be devoted to running so as to even up the qualities as far as possible.

So the duck was kept waddling instead of swimming. The pelican was kept wagging his short wings in the attempt to fly. The eagle was made to run and allowed to fly only for recreation.

All this in the name of education. Nature was not to be trusted, for individuals should be symmetrically developed and similar for their own welfare as well as for the welfare of the community.

The animals that would not submit to such training, but persisted in developing the best gifts they had, were dishonored and humiliated in many ways. They were stigmatized as being narrow-minded specialists, and special difficulties were placed in their way when they attempted to ignore the theory of education recognized in the school.

No one was allowed to graduate from the school unless he could climb, swim, run, and fly at certain prescribed rates; so it happened that the time wasted by

the duck in the attempt to run had so hindered him from swimming that his swimming muscles had atrophied, and so he was hardly able to swim at all; and in addition he had been scolded, punished, and ill-treated in many ways so as to make his life a burden. He left school humiliated, and the ornithorhynchus could beat him both running and swimming. Indeed, the latter was awarded a prize in two departments.

The eagle could make no headway in climbing to the top of a tree, and although he showed he could get there just the same, the performance was counted a demerit since it had not been done in the prescribed way.

An abnormal eel with large pectoral fins proved he could run, fly, climb trees, and swim a little. He was made valedictorian.¹

Almost every teacher, especially those in high school and college, can recall instances where students have had to repeat the same subject several times. Some students have been driven from school because of their inability to pass a certain course after two or three attempts. Others have survived, academically speaking, but in doing so have suffered an ordeal that left its scar on their personality. In cases where students do well or reasonably well in all but one or two subjects and where these, for one reason or another, seem to be insurmountable obstacles, it is good educational procedure to substitute other subjects for the overtroublesome ones. In some instances, the difficulty of the student is overcome if he is given a change of teacher. Adjustment of one kind or another should be made so that failure in one or two subjects will not destroy any student's whole educational career.

Adults are not required to be uniformly proficient in many departments. Adult life does not call for symmetrical development; much less does child life. Only in school do we work for it. In adulthood, we are most successful when we do the work in which we are most interested and when we capitalize on our greatest capacities. To be sure, adult conduct is not an infallible guide in indicating how children should be trained, for it is conceivable that education should aim at establishing different practices, which may be better than the present ones. Still it is extremely doubtful that a pupil should spend on his weaker subjects more time than is average for any subject. To reiterate, more growth results from a unit of time spent in cultivating and perfecting one's greater talents than in attempting to develop one's weakest powers. The Greek ideal of all-round harmonious development is still too much with us.

This discussion can be illustrated by the college record of a person who has since reached a certain degree of distinction. As a student,

¹ DOLBEAR, AMOS E., Antediluvian Education, *Journal of Education*, 68: 424, 1908.

he exhibited marked talent in composition, literature, and public speaking; he was also proficient in history and the other social sciences. In mathematics, physics, chemistry, and the other natural sciences, he was poorer than average. His marks thus showed a sharp division into two groups. In the literary and expressive arts, he was excellent; in the quantitative fields of study, his abilities were below the average of college students. There is hardly any doubt that he profited by having taken the courses in mathematics and natural science, but his greatest natural assets lay in the other fields. Those were the ones in which his development was to be most significant.

He developed his natural talent for effective expression and broadened his knowledge in the social sciences. The history of this individual, as a university president, reveals a serious deficiency because of a lack of that critical insight and realism characteristic of those who have a sharp quantitative sense. If a persistent and laborious study of mathematics, statistics, physics, chemistry, and other similar subjects had developed the power and habit of thinking quantitatively and had given him power to control his affairs with greater regard for the most important factors in the situation, then by all means he should have spent more time on the subjects in which he was poorest.

It is doubtful, however, that special and additional training in those subjects would have changed the character of his mental processes to such an extent as to make him much more effective in adult life. There is little evidence to show that a person's particular intellectual weaknesses can be overcome by special training. In this case, would the imaginative and literary qualities have been balanced with hard-headed realistic thinking? Generally, the strong points are developed to cover the weak ones. Adjustment consists in choosing work that makes only minimum demands on the abilities in which one is weak. The person referred to here was unsuccessful as an administrator, but he did well as a writer and lecturer and therefore did right in cultivating the field in which he was successful.

Life is in some respects like the card game of bridge. In bridge, you bid your best suits, trying to make your best one trumps and then, in playing, making the most of your particular strength in any given suit, be it spades, hearts, clubs, or diamonds. Sometimes a player is strong in all four suits, and then he plays them all. There are people in life who are strong in several "suits," but they must specialize. Of course, their several strengths will help them no matter what area they specialize in.

In dealing with a person's weak and strong suits, there are situations

or weaknesses that should be given considerable attention. For example, if a child stutters, special and even extended effort should be devoted to overcoming this speech defect. Such a defect is a serious handicap in all personal relationships. Hardly any effort should be spared to overcome such a deficiency.

Similarly, if a child is very weak in personal development, shy, uncommunicative, fearful, and suspicious, the teachers must pay special attention to him and try to develop him into a pleasant, personable child who plays and works happily with his fellows. In physical education the teacher tries to overcome physical defects in a child and improve his physical bearing so that he will have fewer handicaps both in childhood and adulthood. Thus, in the kind of instances given, time should be devoted to handicaps until they have been entirely overcome or sufficiently overcome so that the person is no longer handicapped seriously.

But let us consider a case where extreme efforts were made to overcome a weakness that in the first place was not overcome and in the second place probably was not worth much effort anyway. A young man in college, who was unusually gifted in athletics, had a consuming ambition to become a coach. He failed in a course in English, repeated it, and failed again.

The English teacher can still be heard saying, "He must learn to express himself clearly and accurately both orally and in writing."

He failed a third time also. Fortunately, this student was extremely durable and so he outlasted the teacher and finally passed. Most students would have dropped out of college before they would have endured so many failures in a single course.

Now this young man turned out to be one of the best coaches and best referees in the state. In his work he can express himself very effectively and suffers no handicap, even though he probably never satisfied the English teacher. The experience of this man illustrates the truth that a long suit is very adequate for successful living and that no particular handicap need be suffered because of weakness in some academic subjects.

Acceleration by Extra Promotion. A common method of adjusting to individual differences is to give extra promotion to the brighter pupils. Such extra promotion is justified in a sense, for such pupils are capable of doing work one or two grades and even more above the grade that is normal for their chronological age. In fact, the wide range of mental ability in each grade would indicate that the brightest pupils are the most retarded. They are retarded, in effect, because

their mental ability is ahead of the average for their grade, whereas the dull average child is actually accelerated in grade because his mental ability is below that average.

But although these arguments are valid enough, there may be other aspects of the problem in view of which certain objections against too much extra promotion emerge. Furthermore, there may be a better method of taking care of the brightest students. Other factors must be considered besides the capacity to learn. The physical adjustment and social adaptations of the child are also important. Several extra promotions that bring the child into a group whose chronological age level is several years in advance of his own may lead to an unfortunate physical and social maladjustment. A child with mental maturity in advance of his years will be grouped with children who are larger physically and more advanced socially than he. The bright youngster may be able to compete with the older pupils in the recitations and in the examinations but may be a misfit in the sports, games, parties, and general activities of his fellow pupils.

It is questionable whether a pupil should be accelerated more than two full grades, or 2 years, even if he is capable of doing the classwork. A student should not finish high school over 2 years younger than the average of the class. There are exceptions, as always, and each child should be considered as a separate and individual case. There can be no definite rule, but it is a good principle not to group a child so that he is several years younger or older than the other members of his class. When in school, a pupil is living an important part of his life; he is more than a learner of facts and should associate with pupils with whom he can live most happily as well as learn most effectively.

Studies have been made of young accelerated students, and it has been discovered that on the average those who have been given 2 or more years of extra promotion by the time they finish high school are as well adjusted and have as wholesome personalities as pupils who are of normal age. It might be expected that the brighter, more able pupil would be better adjusted than average, but it is possible that some of the brighter pupils were harmed personally by extra promotion of over 2 years. When 2 or more years of extra promotion are faced by a child, the decision should be made in terms of the individual child. Conceivably, a young bright child who is large physically and mature socially will not be injured and may possibly be helped, while an advanced child academically who is small and has tendencies toward feeling inferior might be injured by being placed in a group of much larger children who are considerably more advanced socially. The decision on extra

promotion should always be made in terms of the individual child and not according to any general rule.

Enrichment. By enrichment is ordinarily meant the inclusion of additional materials and activities at a given grade level in order to permit those who can do more than the average amount of work to achieve up to their capacity. Thus, for example, when a geography class is studying the state of New York, the brighter pupils read books on the subject for which others cannot find the time, prepare illustrative materials, interview persons who have been to New York, and in general engage in activities that will give them a more comprehensive understanding of the subject. Opportunities to learn about a subject must be adapted to the individuals of the class according to their individual abilities.

Enrichment not only may manifest itself as the extension of study and activity in subject-matter fields but also may include extra activities such as dramatics, music, bird lore, gardening, and other projects. Enrichment of this kind consists in enlarging the number of activities and subjects as against more extended and intensive work on fewer subjects.

Enrichment for some children is provided outside the school. Some parents introduce special training in music, dancing, dramatics, or art early in the lives of their children and continue it as long as their children are in school. Their children attend special classes after school or on Saturdays. If the pupils are spending some of their out-of-school hours in such activities, the teacher should not load them with special work in order to achieve enrichment. They are already experiencing desirable forms of enrichment, and the teacher may concern herself primarily with enrichment of the subjects and activities usually regarded as the more essential elements in the curriculum.

Modern education with its excursions, group projects, and varied activities allows much more for individual differences in ability than does the old "nose in the book" and "recite to the teacher" method. In group projects and the socialized approach to problems, children have more opportunity to work according to their interests and capacities. Within the same room, the teacher using these more modern methods can stimulate children having a wide range of capacity and offer opportunities that will appeal to them.

The Dalton Plan. One of the more widely known programs for adjusting to individual differences is the *Dalton plan*. It is so called because it was adopted first by the high school of Dalton, Mass. By this plan the rooms of a school are so arranged that a separate room or laboratory is set aside for each subject and is specially equipped. For

example, the history room will have books, maps, and other materials for the study of history. The teacher of history is present in this room, not to instruct formally, but to help the students.

Each assignment covers work to be done in a month's time. Each monthly allotment is called a *contract*. The pupil is given the opportunity to exercise his own initiative as to how soon he is going to complete his contracts in the various subjects during the course of the month. He is tested periodically so that he may know how well he is achieving. About once a month he must complete all his allotments, or contracts, and thus be abreast of all his work. In this way the pupil has done the work in the subject in which he makes least progress as well as that in the subjects which he likes and learns more readily. The Dalton plan and the many modifications of it are methods used to adjust the schools to the individual capacities of the students and thus to get away from lock-step procedures.

A modification of this plan which takes into fuller account the differences in the capacities of children is a system of contracts by which the pupils according to capacity and willingness agree to do different amounts of work and receive a mark appropriate to the amount and the quality of work accomplished.

Conclusion. Great differences in the capacities and characteristics of pupils are a proved fact. There are many ways of adapting the schools to these differences; several methods have been mentioned and discussed. Teachers and schools seldom use one method entirely or exclusively but utilize practices from different ones. Good progressive teachers use the various methods that they find helpful. If teachers, principals, and superintendents know the facts about individual differences and are willing to test methods and actually to experiment with adapting the schools to individual differences, great progress will be made.

All the methods described are a recognition of the differences in the learning capacities and interests of pupils and represent attempts to adjust the school to the interests and capacities of the students. The various modifications and aspects of ability grouping, contract plans, individualized instruction, and departmentalization constitute a direct appeal to the various levels of capacity and interest. Project or activity methods provide informally for individual differences within the group. Special coaching of the dull and the bright, failure of promotion or extra promotion, the four-quarter plan, and promotion every 10 weeks, quarter, or half year are also plans that recognize the differences in the school progress of which children are capable.

SUMMARY AND REVIEW

Today's promotional policies of fewer failures result in less homogeneity than was true formerly when there were more failures.

If possible, children should be grouped so that they are as homogeneous as possible in social and mental development. Children of the same chronological age and intelligence quotient will tend to be homogeneous socially and educationally. Teachers' judgments will prove helpful in classifying pupils.

Very bright children who score high on achievement tests but who have low school marks should be placed in most instances in the most superior group. Instruction should be suited to the different groups, with more drill and repetition and a slower pace for the duller groups and more extensive and advanced work for the superior.

Although the evidence is not very decided, largely because ability grouping has not been utilized fully, ability grouping is apparently conducive to higher achievement and better social development.

A person should capitalize on his best abilities and overcome his weaknesses sufficiently so that they will not handicap him.

Students should not be given so much extra promotion that they will be in a class where the children are much larger and stronger. Young bright children can be helped by enrichment, and thus too much acceleration and its ill effects can be avoided.

The purpose of individualized instruction and the Dalton plan is to provide opportunities for children to progress at the rate of which they are capable. Social development is provided by group activities.

Test Your Thinking

1. If children of nearly the same chronological age and I.Q. and thus the same mental age are grouped together, it is probable that they are also more homogeneous socially than the typical heterogeneous group. Discuss.
2. If children are classified into groups according to their capacities to learn, the teacher and teaching should be suited to the different groups. Comment.
3. List and discuss the advantages and disadvantages of the methods of individualized instruction.
4. Give your reactions pro and con to the extract from Dolbear's article (pages 239-240).
5. Do you believe in capitalizing on your strong suits or building up your weak ones? Comment.
6. What are the dangers in extra promotion?
7. What is meant by enrichment as a substitute for extra promotion?
8. What is meant by lock-step methods?
9. How does the Dalton plan avoid being a lock-step system?

References

- BARTHELMES, HARRIET M., and PHILIP A. BOYER: An Evaluation of Ability Grouping, *Journal of Educational Research*, 26: 284-294, 1932.
- BELDING, R. E.: Cleveland's Child Progress Plan, *Journal of Education*, 129: 88-90, 1946.
- BURNHAM, W. H.: Success and Failure as Conditions of Mental Health, *Mental Hygiene*, 3: 387-397, 1919.
- COREY, STEPHEN M., and others: Grouping Children: A Discussion, *Educational Leadership*, 4: 365-373, 1947.
- DOLBEAR, AMOS E.: Antediluvian Education, *Journal of Education*, 68: 424, 1908.
- GERLACH, D.: Treating Individual Differences in Texas Schools, *Social Education*, 10: 298-300, 1946.
- HUME, J. C.: Guidance, Curriculum Revision, and Work Experience as a Means of Providing for Individual Differences, *School Review*, 50: 204-211, 1942.
- KRUG, EDWARD, and G. LESTER ANDERSON: Adapting Instruction in the Social Studies to Individual Differences. *Fifteenth Yearbook of the National Council for the Social Studies*, 1944.
- MILLER, W. S.: *The Classification of 6A Pupils into Ability Groups*, Proceedings of Minnesota Society for the Study of Education, 1924.
- PARKHURST, HELEN H.: *Education on the Dalton Plan*, E. P. Dutton & Co., New York, 1922.
- PINTNER, RUDOLPH: *Intelligence Testing*, Henry Holt and Company, Inc., New York, 1931.
- SMITH, B. O., and A. J. DOLIO: Recent Developments in Grouping, A Minimum Bibliography, *Educational Leadership*, 4: 403-411, 1947.
- TURNEY, A. H.: Status of Ability Grouping, *Educational Administration and Supervision*, 17: 21-42, 110-127, 1931.
- WHIPPLE, GUY M. (ed.): Adapting the Schools to Individual Differences, *Twenty-fourth Yearbook of the National Society for the Study of Education*, Part II, Public School Publishing Company, Bloomington, Ill., 1925.
- WILCOCKSON, M.: How Ability Groups Improve Social Climate, *Education Digest*, 12: 28-31, 1946.

CHAPTER XII

HEREDITY, ENVIRONMENT, AND HUMAN DEVELOPMENT

What to Look For. Note how a teacher's point of view about nature and nurture will influence her methods in dealing with her pupils.

Some human qualities are influenced more by hereditary forces and some more by environment. Try to learn what these characteristics are.

People inherit through the germ cell with its chromosomes and genes. Try to understand the mechanics of inheritance.

Three principles of inheritance are discussed. Their interfunction should be understood.

It is pointed out that both greatness and failure run in families and that biological inheritance is accompanied by corresponding social inheritance.

Observe that the closer the blood relationship the greater the correspondence in abilities and characteristics.

The abilities of children tend to correspond to the occupational status of the father, but note that here again heredity and environment accompany each other correspondingly.

Learn what happens to the abilities of rats when "bright" and "dull" are mated with their own kind.

Learn what effects the foster home has on foster children in terms of intelligence, school progress, and character.

The twins of each of twenty pairs of identical twins were raised in different environments and the effects on the twins studied. What were the differential effects on the twins?

Note that failure to attend school influences the intelligence, as is shown by the study of canalboat and gypsy children.

We have long known that the youngest children in the grade are the most capable and the oldest the least capable. Observe that this seems to be indisputable proof that there are real inherent differences in the capacities of school children.

Consider the idea presented here that environment does not make people but that people make environment.

Note that the teacher has a great opportunity to enhance the personalities and abilities of pupils.

Introduction. "I can't pound a single idea into the head of that Cooper brat, it seems," said Miss Brice, the third-grade teacher, who was exasperated over her failure to get Joe Cooper to respond to her teaching.

"Every teacher who has taught Joe has had the same trouble you are having," replied Miss Jones.

At this remark, Miss Black, another teacher, interjected, "I think that Joe can be taught if we learn how to appeal to him. If we had the right method, I'm sure that Joe would learn as much as any pupil."

"I think he comes by his dullness naturally," replied Miss Brice. "His parents are not very bright. Both of them dropped out of school before they finished the eighth grade, and they got very low marks."

"Joe's brothers and sisters aren't good students either, except Margaret in the seventh grade, who does a little better than average," commented Mr. Nye, the principal.

"What shall we do?" asked Miss Black, who believed that all children can make good progress in school if we use the right methods. "Shall we say it is no use and let pupils like Joe just drift along?"

"No, I think we should do all we can for each student, regardless of his ability, but I feel that some students will learn much less readily than others," was Mr. Nye's answer.

And a bell rang, and the teachers went to their respective rooms.

Nature-Nurture and Our Point of View. We often ask ourselves whether the characteristics of a child—his being good or bad, bright or dull, healthy or sick, happy or unhappy—depend principally on his heredity or on his environment. Likewise, in judging an adult, some attribute his success to his opportunities, whereas others hold that he was born with much potentiality and became successful because of his good inheritance.

Some observers think that it is futile for educators to concern themselves with this problem of the relative influence of heredity and environment. They say that teachers cannot do anything about basic heredity but must accept children as they are and teach them as effectively as possible.

Obviously, such a viewpoint is superficial. It is equivalent to putting our head in the sand instead of being intelligent about an important problem. A teacher's attitude toward her individual pupils, the way she deals with them, is much influenced by her knowledge of the forces of nature and nurture and her consequent point of view. If she believes that nurture is the complete force and that nature is little or nothing, she will believe that all children are alike and can be taught an un-

limited amount. Her efforts, she believes, will then count almost equally with every child. If, on the other hand, she believes that children differ in their potentialities and capacities, she will feel that her efforts will bring different results with different pupils and she will have different expectations for different pupils.

If the laws of heredity were understood and acted upon, progress could be made in improving the race by genetic control. If the importance of environment were accurately understood, more efficient schools, churches, prisons, and asylums could be maintained.

To the teacher, knowledge of the relative effect of the forces of heredity and environment on human development and their interrelationship is of signal importance. Teachers are the main environmental factor in the children's school life. A teacher is valuable according to her ability to develop the potentialities of her pupils and to make desirable changes in them. She must understand the possibilities and limitations of the human material with which she works. Her philosophy and methods of teaching are greatly affected by her concepts of the possibilities of training and education.

The teacher who believes that children's development depends on her efforts alone will misdirect much of her energy. There are teachers who believe that "every child is a diamond in the rough which needs only polishing in order to reflect the light of intelligence." According to this notion, every child has great possibilities that will be realized if the teacher will only work hard enough to develop them.

Other instructors feel that a child will develop in the directions determined by his heredity and that the guidance and training of children by parents and teachers matter very little. A teacher with such beliefs will miss many opportunities to develop the latent capacities of her pupils.

The extreme view on the potency of training was dramatically stated by the psychologist Watson, who startled the world by saying, in substance, that if he were given a group of healthy infants he could train or condition them to become lawyers, beggars, doctors, or thieves, and that he would use definite psychological methods to make each infant into an adult of a predetermined pattern. Such a plan of training assumes that what a child can be made into depends entirely on the training he has received and denies almost entirely the variation in quality of the human organism.

Other students of this problem are reasonably sure that some infants are born with a quality of nervous system that will prevent them from ever acquiring the knowledge and abilities necessary for certain achieve-

ments. There are people, it is believed, who will never acquire enough ability to be musicians, writers, lawyers, or doctors. Possibly a few educators and psychologists hold that psychologically sound training is all that is needed to mold the human organism into any pattern, but such an extreme point of view is hardly based on sound evidence. It is futile, however, to discuss the influences of environment and heredity without making clear the particular nature of these influences. One's point of view should be differential rather than general, and one should think of the specific effects of heredity on various human qualities and characteristics.

Probably heredity is largely responsible for some human characteristics; environment, for others. The color of the eyes, width of the head, fingerprint patterns, age at puberty, and stature are probably determined chiefly by genetic factors. On the other hand, such psychological matters as temperament, disposition, ideals, and attitudes are probably more affected by environmental influences. This probably is especially true of ideals and attitudes. Specifically, the health of a normal child depends to a considerable extent on the good sense that the mother exercises in caring for him. For example, raising children without an adequate diet causes many of them to develop rickets, but children who are well nourished, given cod-liver oil in the winter, and exposed to sunshine in the summer rarely develop rickets. Health and qualities of personality reflect the care and training that one has received, whereas some traits and characteristics are more fixed at birth. Scientific care during the prenatal period and during infancy prevents a large proportion of deaths; but after a person has reached middle age, the factors that determine whether or not he will live a long life are largely hereditary in nature. Thus the relative influence of environmental and hereditary factors may vary at different ages and influence various characters differently.

The Mechanics of Inheritance. A human being has its beginning in the union of the male germ cell, the sperm, with the female germ, the ovum. They unite and then divide. Cell division continues, and the result is the growth and development of the embryo. The united germ cells of the parents also separate and are preserved in the embryo. Thus, the child carries the germ cells of its parents, and so that the stream of germ cells is continuous from generation to generation.

The determination of the characteristics and potentiality of a child is not a haphazard trial-and-error matter. The characteristics of a child and his potentialities are determined genetically according to definite quantitative and scientific laws. In the germ cells of the father

and mother are definite quantities known as *chromosomes* and *genes*, which unite and determine, for example, whether or not the child is to be black or white, blue- or brown-eyed, tall or short, bright or dull, strong or weak, and so forth. There are definite factors, then, in the germ cells of the parents that determine the quality and characteristics of a child.

The germ cells contain chromosomes, 24 in the germ cell of each parent. The chromosomes, in turn, are made up of genes, or determiners, and each chromosome consists of about 40 to over 100 of these determiners. At the time of conception, the genes, or determiners, in the chromosomes of the sperm pair with the genes of the ovum and

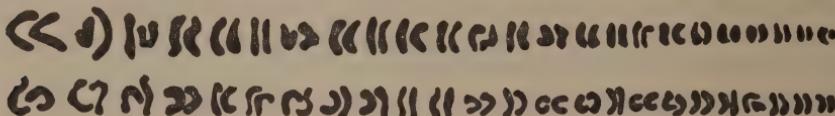


FIG. 14. Chromosomes of the human male in the upper row and the human female in the lower row arranged in order of size. (*From Evans and Swezy in Memoirs of the University of California.*)

determine the potential characteristics and qualities of the offspring. The result of the union of the genes we call *heredity*. Figure 14 illustrates the process graphically. The processes of heredity are very complex, but this diagram presents the general idea.

If the father's genes for tallness unite with the mother's genes for tallness, then the offspring will inherit tallness. Similarly, if the male genes for good mentality unite with the female genes for mentality, then the child will inherit brightness, and similarly for nearly all traits. If, for example, the father and mother carry genes for weak lungs and these genes pair, then the offspring will have weak lungs and will have a predisposition to tuberculosis. If the environment of the offspring is conducive to tuberculosis and causes him to be exposed to infection, he probably will become infected. Disease is not inherited, but the weaknesses are; therefore, some people have a natural predisposition to infection, whereas others are born so strong that they resist nearly all diseases.

This summary description is a very simple, probably an oversimple, explanation of the inheritance of traits and abilities as determined by the uniting of the genes of the chromosomes in the sperm and ovum. Nevertheless, essentially it describes the process of inheritance. Discussions of certain other important factors, such as Mendelianism, dominance, recessiveness, sex-linked and unit characters, and mutations, can be found in books on genetics or biology. The mechanics of human

inheritance are not definitely known to the extent that we can determine how specific traits are inherited, but for our purposes it is sufficient to indicate the general principle.

Heterozygous and Homozygous. Have you wondered why in some cases the children of the same families differ so much while in other families they are so much alike? In one family the children may be both dull and bright or tall and short or have red hair and black hair, while in other families all the children are about equally bright, are correspondingly of the same height, and have hair of the same color. The causes for the dissimilarity or similarity in the children of the same family are to be found in the genes of the germ cells of the parents of the children. If the genes, or determiners, of the parents vary for the various personal qualities, then they are said to be *heterozygous*. Thus, very brilliant men or women may carry genes for the quality of intelligence ranging all the way from dullness to brilliance. The reason for this is probably that such persons have ancestors who varied greatly in their intelligence. If the genes for brightness combined, the offspring would be bright; but the genes for dullness might unite, and then the offspring would be dull, and similarly for all degrees of intelligence between these extremes. Some adults carry more genes for producing an organism that learns readily from its environment than do others, and some carry determiners for an organism that adjusts poorly to its environment. The majority of people carry genes that produce an average or nearly average organism.

If the genes do not vary in quality for any given characteristic, they are said to be *homozygous*. All the offspring from parents who are homozygous for any given trait will be uniform in that trait or quality, be it eye color, hair color, intelligence, health qualities, or what not.

It is doubtful that the genes of husband and wife are homozygous for any given quality. The germ cells carried by any individual have such a varied background of ancestors that it is doubtful that the determiners are homozygous. If two parents were homozygous for high mental capacity, for instance, then all their offspring would inherit high mental capacity. If the germ cells were homozygous, no determiners would be present to cause low mental ability. On the other hand, if the parents were homozygous for feeble-mindedness, then all their offspring would be feeble-minded.

In the selective breeding of horses and cattle an attempt is made to breed the better animals because they have the most genes, or determiners, for producing the best offspring. For example, in breeding race horses the best runners are used for breeding purposes; and among those,

in turn, the best parent stock is soon discovered when the abilities of the colts are tested. The same principle is applied to dairy cattle; in their case the test consists in the ability of the offspring to produce butterfat. When the best animals produce offspring and the poorer ones do not, the result from generation to generation is that the animals possess more of the better genes, or tend to become homozygous for the highest qualities.

Improving Human Beings Genetically. One can hardly touch on the process of inheritance without raising the question of improving the quality of people genetically, that is, through selective mating. Would the average quality of our people be raised if the more gifted had more offspring and the dull and feeble-minded had very few, if any? Most of our inadequates are born not of parents who are idiots or imbeciles but of parents at the moron or borderline level. Even though parents of low intelligence and character did not have offspring, however, incompetents would still be born to capable parents, for the germ cells of some of them contain defective genes. Nevertheless, there would be fewer defectives, and they would become progressively fewer from generation to generation. People would carry fewer and fewer determiners for deficiency.

Even though the average quality of the human organism were raised by selective mating, our educational, social, and economic problems would not automatically be solved. Variation in abilities would still exist; and although the variation would not be so great as it now is, still we should have the relatively stronger and the relatively weaker. It should be the function of education, with the ideals, attitudes, and motives that it inculcates, to determine whether or not the strong would still continue to exploit the weak. This would not be easy, for there would be a larger proportion of the strong and a smaller proportion of the weak. There would be many fewer people unable to earn a good living; in other words, there would be far from as many as there now are who find their environment too difficult for them.

For educational purposes the improvement would be great. There would be many fewer dull children, and the average quality of the class would be much higher. In any class or grade the children could learn much more and consequently make more progress than they now do.

A professor of educational psychology expressed a striking point of view as to the importance of heredity and environment when he stated to the students in his college class that, if the most capable of his class mated with those of similar capacity and had large families, they would contribute more to society than by being teachers of children. The

point is probably well taken, although we should not necessarily take the position that hereditary forces are more important than environmental forces, or vice versa. We need both a good biological and a good social heritage. It is not so much a question of which is more important but how the best values in each can be utilized. Furthermore, it is well to recognize how much we can accomplish genetically, how much educationally, and how much by means of other environmental forces. It is a matter, not of one against the other, but the particular function of each and their most effective balance and working together.

Congenital Influences. The congenital period of life is the embryonic and fetal period, or the period of pregnancy, or gestation. It is the period between the union of the male and female germ cells and the time of birth. For human beings it is about 9 months long.

Questions are often raised about the various factors that may affect the embryo and fetus and thus influence the character of the child. The effect of faulty nutrition on the growing embryo or fetus, of pressures and strictures on its development, and of the chemical balance of the mother are still matters of speculation. Little is known about them, although it is certain that some children are injured at birth in a manner that affects them physically and mentally during all their lives. Venereal diseases may also be contracted congenitally, or during the gestation period. Now we read about an Rh factor, or the incompatibility of the mother's blood with the embryo and fetus, that influences them unfavorably.

Little need be said about the transmission to the embryo and fetus of the experiences and thoughts of the mother during pregnancy. The superstition that pregnant mothers frightened by dogs or otherwise frightened or distressed will consequently give birth to dog-faced children or other monstrosities has no validity. Illness and great emotional stress may possibly affect the embryo, but the wishes and ideals that a mother has for her child are not transferred to it. A mother may listen to great music and hope that her child will thus become a great musician, or she may spend hours viewing masterpieces of painting with the wish that her offspring will become a distinguished artist. She may daydream about the future of her child, but all her hopes and visions have absolutely no effect on the embryo or fetus.

Children do not inherit the acquired abilities of their parents. As an adult gets older, he may acquire different skills, increase his efficiency, and add to his store of knowledge, but such improvement is not transmitted to his offspring. The germ cells are independent of such influences. If the values of parent's experiences were inherited in the children,

the younger children in a family should surpass the older, or the last-born should be more capable than the first-born. But this is not the case; there is no relationship between order of birth and the intelligence of the offspring.

SOME PRINCIPLES OF INHERITANCE

Like Begets Like. The general principle of inheritance is that like tends to beget like. This principle will be interpreted here to mean that bright parents tend to have bright children; average parents, average children; and dull parents, dull children. Similarly, in the case of physical size, there is a tendency for the mature size of the offspring to be similar to that of their parents. Thus, on the average, the children tend to be like the parents, but there are many exceptions to the rule. This fact leads us to the second principle, the principle of variation.

Variation. Children are not exact replicas of their parents, nor do they develop to be precise reproductions at any given age of what their parents were at that age. The reason lies in the characteristics of the germ cells of the parents. Germ cells contain many determiners, which unite in different combinations to form offspring differing among themselves.

For purposes of illustration, let us assume that two human parents could have a very large number of children. The average quality of the offspring would be determined by the quality of the parents' germ cells. For some parents, the average would be high; for most, it would be average; for some, it would be low. Most of the children would be at the average of their parents or near it, but they would vary from that average. The fertilized germ cells are usually heterozygous, as was explained a few paragraphs back.

This principle of variation explains why children in the same family differ in intellect, size, and temperament. They are a product of different combinations of the determiners in the parent germ cells. But though they differ, they tend to be more alike than do unrelated children. Brothers and sisters (siblings) have their similarities, although they vary from the family average.

Regression. The tendency for children of very bright parents to be less bright than their parents and a comparable tendency for the children of very inferior parents to be less inferior is called *regression*. For any trait, there is a tendency for the children to regress toward the average. Not all the offspring will regress; but, on the whole, they will move toward the average rather than farther below or above it, as the case may be.

Usually the children of a very gifted father or mother are not so

gifted as the parent. A son of a great athlete seldom becomes as great as his father or the son of a great scientist as great as his father. There are several reasons for the regression. In the first place, the father, for the traits that he possesses, represents the product of the most fortunate combination of the determiners in the germ cells of his parents. Therefore, the germ cells that he carries are, on the average, inferior to the particular combination from which he developed.

Second, it is likely that he will mate with a woman not so distinguished as he and that his mate will be almost certain not to carry germ cells so good as those which combined at the time of his conception. Though the offspring will tend to be decidedly above the average, it is unlikely that they will be as great as their father. This is regression.

Similarly, the germ cells of two idiots are probably better than the combination from which they sprang; therefore, the offspring of such parents would be better than the parents, possibly averaging imbecile or low moron level. Occasionally a child of two idiots has average ability, and sometimes there are offspring as deficient as their idiot parents, but most, though deficient, will be higher than the father and mother.

These three general principles—like tends to beget like, variation, and regression—are useful in trying to understand human characteristics and qualities. In general, the offspring tend to be as bright, as tall, as healthy, etc., as their parents, but they vary above and below the average ability of the stock from which they spring. Furthermore, there is a tendency for the offspring to be lower in the characteristics in which the parents are high or higher in those traits in which the parents are low. They regress, or move toward the average.

Ancestry and Inheritance. The child's heredity, however, is not determined solely by his immediate parents. He inherits not only from his father and mother but from his grandparents, his great-grandparents, etc. In other words, he inherits from his ancestors, though, of course, he inherits most from his immediate parents. As the parentage becomes more remote, the hereditary influences decrease. It is partly due to the heredity from these less immediate ancestors that very superior parents generally have less superior children and very inferior parents have children better than themselves. The hereditary determinations, however, from remote ancestry are least influential. Most of a person's inheritance comes from his immediate ancestry.

FAMILY LINEAGES AND RELATIONSHIPS

Distinction and Deficiency in Family Relationships. Studies have been made of certain family trees to ascertain if some consistently bear

very good fruit and if some bear largely poor and rotten fruit. A large number of details could be given, but only a few pertinent facts will be set forth here.

It can be said at the outset that eminence and distinction are found in some family lineages and feeble-mindedness, insanity, and criminality in others. Of course, most families are average, with some members above average and others below. If, for example, you took the outstanding men and women in a city or county, say the most outstanding person in 4,000, and then took the same number of persons at large, you would find that the eminent persons would have many more relatives of high standing than those picked at random. In fact, Francis Galton, a great English scientist of the nineteenth century, made such a study and found that there were 134 times as many outstanding relatives of distinguished men as of persons taken at large.

Feeble-mindedness, insanity, criminality, or social deficiency of one kind or another runs in families, too. Very often several feeble-minded will be found in a single family, and feeble-mindedness has been prevalent in a family for several generations. Studies of two family lineages, those of the Jukes and the Kallikaks (both fictitious names), show a distressingly large number of inadequates. Many were thieves, indolent persons, feeble-minded persons, prostitutes, or insane persons. There were some normal and adequate persons, too, of course, but many inadequates came forth each generation. Studies of the families of persons committed to prisons, insane asylums, and institutions for the feeble-minded show that they have many relatives who have the same deficiencies.

Environment as a Cause of Strength and Weakness. When a candidate for the doctor's degree was asked during his examination how he explained the fact that eminence and distinction occurred consistently in some families and deficiency in others, he answered that it was because of the environment into which the offspring were born. The relatives of eminent men, he explained, are brought up in good homes and are given the best of care and education. The children born to parents who are social inadequates are brought up in an environment of neglect and bad influences. There is no question about the fact that superior heredity and good environment go together and that inferior family background and poor environment also go together. It is interesting to contemplate the question whether it is principally that people make environment or that environment makes people. Cause-and-effect relationships are difficult to explain satisfactorily.

There is no question that environments make a big difference, but

it is probable that a boy or girl of good qualities will rise above poor environment. Many of our greatest men have done so. Furthermore, it is certain that the best environment will not make a bright adult out of a feeble-minded child, and it is almost certain that a distressingly large proportion of the potentially criminal and insane will not be saved from crime and insanity even though many controls are brought to bear on them. Environment tends to improve the human stock or make it poorer because of the marriages it brings about. Persons of the same socioeconomic levels tend to marry each other. Thus those raised in good environments tend to marry each other, as do those who are raised in poor environments. Environment and heredity, therefore, work together to keep high capacities in some family lineages and poor capacities in others. Hence environment tends to be a selective factor as well as an educational factor.

BLOOD RELATIONSHIP AND ABILITIES

In the same generation the most closely related individuals are identical twins—born from a division and growth of the same cell. Next in degree of relationship are fraternal twins, or those born from the union of two separate cells; then children of the same family, or brothers and sisters; then cousins; and so forth. The correlation of abilities between parents and children is higher than between grandparents and grandchildren or between uncles and aunts and their nephews and nieces.

The relation of abilities is known, not for all degrees of blood relationship, but for enough to indicate that abilities correlate to an extent corresponding to the nearness of the kinship. Correlations have been calculated to determine the relation in tallness, weight, mental-test ability, and achievement in school subjects as well as in other characteristics and abilities. The results vary a little from investigator to investigator, but the following correlations for the various degrees of blood relationship are reasonably accurate in indicating the general trend.

Relationship	Correlation
Identical twins . . . . .	.80-.90
Fraternal, or nonidentical, twins . . . . .	.65-.70
Brothers and sisters (siblings) . . . . .	.45-.50
Cousins . . . . .	.20-.35
Unrelated children . . . . .	.00
Parent-child . . . . .	.40-.45
Grandparent-grandchild . . . . .	.10-.20

Of course, these correlations are not necessarily indisputable proof that various physical characteristics and the capacities for various abilities are inherited according to the degree of blood relationship. For, in fact, it is likewise true that, the closer the degree of blood relationship, the more nearly alike the environment.

In the case of twins, prenatal environment is more similar than in the case of nontwins. Brothers and sisters experience a more similar environment than do cousins; nevertheless, the fact that sisters and brothers differ is just as valid an argument that traits and capacities are inherited as the fact that they correspond to a degree represented by a correlation of .45 to .50.

The knowledge of right or wrong of parents and children correlates about .50, which is essentially the same as the correlation for nearly all other traits and capacities. Although the capacity for ethical knowledge is perhaps inherited, like the capacity for any kind of knowledge, it would seem that a knowledge of ethical conduct and related ideals and attitudes is to a large extent the product of home teaching and home environment. That the parent-child correlation for a quality probably acquired is as high as the correlations for other qualities generally considered inherited raises a question as to the validity of concluding that high correlations indicate the inheritance of those qualities.

This conclusion, which has been reached by some observers, is a little extreme, no doubt, but represents a belief that contains truth. It serves, at any rate, to point out the fact that environment works with heredity in making related persons more alike. Nevertheless, it is true that no one can observe the appearance of a pair of identical twins—the similarity of size, features, eye color, twirl and shade of hair, finger-print, achievement in school, and disposition—without recognizing the importance of hereditary factors. On the other hand, the variations in the characteristics of siblings is not inconsistent with what we know about the principles of inheritance.

OCCUPATIONAL STATUS OF FATHERS AND MENTAL ABILITIES OF THEIR CHILDREN

A further point of interest is the relation between the vocational level of the parents and the intelligence of their children. Teachers, others who work with children, or anyone especially interested in children will find useful a knowledge of the relationship of the mental abilities of children to the work that the father does. The occupational

status of the father is a general index to the mental abilities of the child, but only an approximate one, and not to be depended upon for judging the individual child. However, to know the relationship will enable the teacher to understand her pupils better. She will know, for example, that students in a district where the fathers are largely lawyers, doctors, professors, and business executives will have on the average considerably more ability than the children in a district where the parents are of the unskilled laboring class. Knowledge of this kind helps in understanding children and why they are as they are.

The occupational status of parents is generally distributed over a range, at one end of which are the unskilled and at the other the professional workers. The categories often used are unskilled, semiskilled, skilled, business-clerical, and professional. Some representative occupations in an order corresponding to the classifications given are hobo-transient, unskilled laborer, teamster, butcher, carpenter, policeman, automobile mechanic, railroad clerk, bookkeeper, accountant, schoolteacher, librarian, doctor, engineer, creative writer, and scientist. These occupations are considered representative of different positions in the occupational scale according to the amount of education, mental ability, or abstract intelligence required. This classification is arranged according to the average for each occupational group.

There is a large range of ability, of course, in each classification. Some persons engaged in the less skilled occupations possess more abstract intelligence than some in the more skilled occupations and even than a few in the professional occupations.

We know that the I.Q.'s of the fathers correspond in general to their occupational status, and we should expect that the intelligence of the children would correspond in a general way to the occupations of the fathers. And, in general, men marry women of corresponding intelligence. Thus, on the average, the children of professional parents have the highest I.Q.'s and those of unskilled workers the lowest. This is, in fact, the trend. The correlation between occupational status of parents and I.Q. of the children is about .40. The relationship is very general, and again the question may be raised as to whether or not the superiority of children of professional parents is due to the genes of their parents or to the difference in the cultural and educational environment into which they are born. A child of professional parents obviously is the beneficiary of more advantages than a child born into the home of an unskilled worker or of parents on relief. Again we are in a situation where the relative effects of environment and heredity cannot be dis-

tinguished; consequently, the differences in the qualities of the children cannot be definitely attributed to either. There is some likelihood that hereditary qualities accompany vocational status to some degree.

Eminent men have come from homes where the parents were of professional and business status more often than one would expect from the numerical proportion of these groups to the total population. In contrast to this fact, the laboring classes and the agricultural groups, which constitute such a large proportion of the population, produce only a relatively small percentage of the more distinguished and prominent persons. Table 5 indicates that the professional and semiprofessional groups, which constitute smaller proportions of the population, produce about three-fourths of the eminent men and gifted children. Profes-

TABLE 5. COMPARISON ON TAUSSIG SCALE OF THE OCCUPATION OF THE FATHERS OF PHILOSOPHERS, POETS, AND SCIENTISTS (ALL COMBINED) WITH THE FATHERS OF TERMAN'S GIFTED CHILDREN*

Taussig classification	Fathers of philosophers, poets, and scientists (all combined)		Fathers of Terman's gifted children	
	Number	Percentage	Number	Percentage
Professional.....	65	46.1	176	31.4
Semiprofessional.....	35	24.8	280	50.0
Skilled.....	35	24.8	66	11.8
Semiskilled.....	6	4.3	37	6.6
Common labor.....	...	.....	1	0.13
Total.....	141	100.0	560	99.93
Unclassifiable.....	30			
No record.....	43			
Grand Total.....	214		560	

* PATERSON, DONALD G., and EDMUND G. WILLIAMSON, Raymond Pearl on the Doctrine of "Like Produces Like," *American Naturalist*, 63: 272, 1929.

sional men constitute about 5 per cent of the population but are the fathers of 46.1 per cent of distinguished men and therefore are fathers of eminent men over nine times as frequently as could be expected in terms of their numbers.

SELECTIVE MATING

If, for example, the brightest, healthiest, and those of best character married those like themselves, would the children be like the parents? If those who were dull and had poor health and bad morals

married those like themselves, would the offspring be like the parents? Or could a psychologist take children from either stock and make them whatever he tried to make them?

We have, of course, no experimental results on human beings, although we have a large amount of evidence indicating that family stock contributes much to what a person is. Even though the earnest, intelligent teacher who understands educational psychology can do much for every child no matter what his natural endowments are, it is doubtful that he can overcome certain limitations.

It is interesting to examine a study on the selective breeding of rats that were bred according to their abilities to run a maze. In a sense, the ability to run a maze measures the intelligence of a rat. Tryon, after he had tested a group of rats on the maze, bred the most intelligent rats with the most intelligent and the least intelligent with the least intelligent. He did this through a number of generations in order to determine whether or not through the generations there resulted from this selective breeding a bright and a dull group.

Figure 15 shows the parent group and the fourth and eighth generations. The reader should note carefully what has taken place.

Note that the parent, or beginning, group has abilities ranging from less than 10 entrances into blind alleys in running the maze to about 225 such entrances. It will be observed that most rats were average and that the distribution of abilities is a typical one.

By the fourth generation, as a result of selective mating the developing of two separate groups of rats has progressed to a considerable degree. By the eighth generation there is almost complete separation of the two groups. It is interesting to note that there is a rat in the eighth generation of the "bright" mating which is poor, having made about 150 blind alley entrances. Apparently, the rat is a result of the union of poor genes of bright parents. This is parallel to a dull child being born to very bright parents.

In this experiment, only one ability was considered, but in terms of that ability it is evident that, when the best learners are mated with the best and the poorest learners with the poorest, in a few generations there is a remarkable difference in the learning abilities of the two different groups of offspring. Perhaps the teacher and the parent can learn from this experiment that there are true differences in the native learning abilities of children and that parentage is responsible for the differences. Of course, there is a long phylogenetic distance from rats to men, but there is so much in common in their genetics that it is safe to draw some conclusion about human learning from what has been found for rats.

ADOPTED, OR FOSTER, CHILDREN

Adopted, or foster, children have been studied in order to discover what effect the foster home has on their intelligence, school progress, and behavior. The true parents and family background of the foster

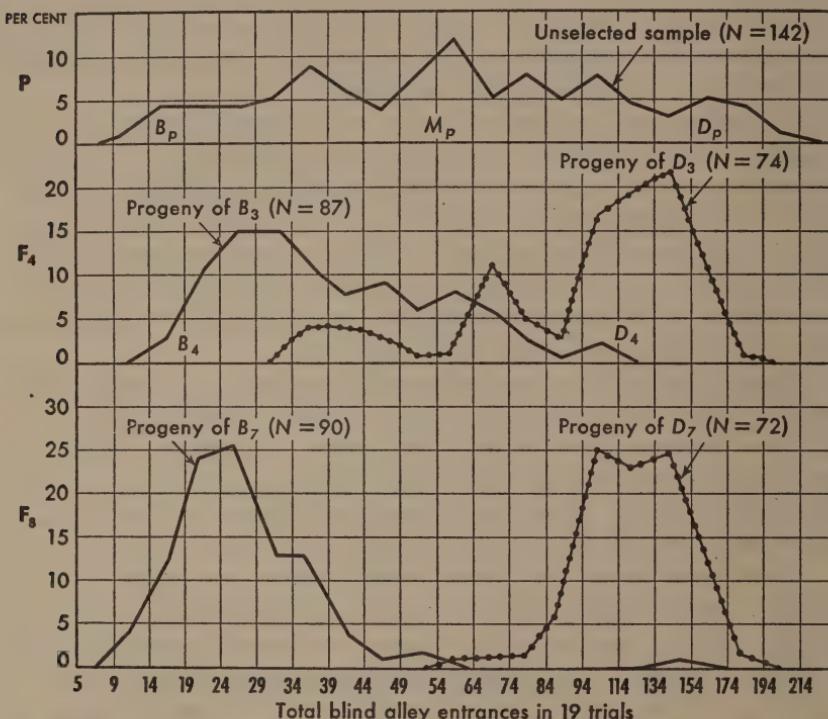


FIG. 15. The effects of selective breeding on maze learning ability in rats. By selecting the better learners of each generation and breeding them, groups of rats consisting of the better and poorer learners respectively are produced. By the eighth generation the separation of the two stocks is practically complete. Each group, however, shows an approximation to a normal distribution of ability, suggesting a multiple gene basis of the trait. (Adapted from R. C. Tryon, "Individual Differences," in *Comparative Psychology*, edited by Moss, Prentice-Hall, Inc., 1934.)

children were known, and the kind of foster home in which they lived was studied. Their intelligence was measured carefully by intelligence tests, their progress in school was carefully checked, and their behavior carefully evaluated.

In the study of foster children, special attention is paid to the influence of environment. This can be done because the foster parents are not the true parents and consequently a genetic or hereditary re-

lationship does not exist. Second, the quality of the foster home can be rated and the effect of the home on the foster child evaluated in terms of the quality of the home.

The home is evaluated in terms of its expected influence on the foster child. A home is rated high if the parents are of high standing in the community, if they are well educated, if they have good financial means, if they have a home with good books, a radio, and a telephone, and if the house is an ample, well-built, attractive one in a good community where the other children are intelligent and well behaved. In such a home the foster children are under the best influences and have maximum opportunities for developing their intelligence and character.

Homes at the other end of the scale are in poor districts; the parents are of poor character, little education, and small income, and care little what becomes of their children. In these homes the influences make for poor school attendance, lack of ambition, and delinquency. These two types represent the extremes of the scale, and between these extremes the various foster homes can be classified.

Various studies have been made, and the following facts have been found: Intelligence or I.Q.'s develop more in the better than in the poorer homes; the longer the foster children are in the home, or the earlier the children were adopted, the greater the increase in I.Q. Part of this may be due to the tendency of parents from better homes to choose better children. Being abler persons, they would select children with a better family background.

The advantageous influence of the better home is not very large on the average, probably being about 5 to 8 points in I.Q. In some individual cases it is as high as 15 to 20 points, but it is doubtful that this can be attributed to the influence of the foster home alone. Individual cases do not constitute very reliable evidence, although the average of a large number does. The particular individuals might have increased in intelligence under very average circumstances anyway, or there may have been some unreliability in the testing.

In the matter of school progress, it has been discovered that foster children make good or better than average progress in elementary school. In high school, this is not the case. The explanation lies in the fact, perhaps, that the true parentage of the foster children studied may not have been good. It is more often the case than not that the children available for adoption have shiftless and inadequate parents. Otherwise, they or members of their family would take care of the children, who would not be given away to foster parents. Many foster children have poor heredity. The result would be that when

they attend high school the work becomes too hard for them. In grade school, through their own efforts and with the guidance of their foster parents, they can do the work satisfactorily, but in high school the comparatively more difficult algebra, foreign languages, history, English, and science are too difficult for them to master.

The behavior of foster children is very favorable in terms of family background. The foster children studied had much better records than their true parents had had and than they probably would have had, if they had been left in the environments of their true instead of the much better environment of their foster homes. It seems, then, that the greatest favorable influence of foster homes on foster children is on their behavior. This is very important and encouraging, too.

In summary, it can be said that the study of the foster-home environment on foster children indicates that their intelligence reflects the quality of the home, increasing a little more in good than in average or poorer homes, though the increase is not large in any foster environment. School progress of foster children is influenced favorably by their homes, but the home environment cannot overcome limitations in native or hereditary endowment. The behavior of foster children reflects very favorably the influences of the foster home, for it is better than could be expected in terms of hereditary background, which was in the instances studied often very unfavorable.

IDENTICAL TWINS REARED IN DIFFERENT ENVIRONMENTS

The Similarity of Identical Twins. The reader has probably had experience with twins whom he could not tell apart. He may have had the embarrassment of not knowing which was which and talking to one when he thought he was talking to the other. Such twins, known as *identical twins*, have been carefully studied to discover how much alike they are in physical, mental, and educational characteristics. They have been compared in height, weight, width of head and hip, and length of head. They have been compared by carefully administered mental examinations and by the use of achievement tests in various school subjects. It has been found that there is a high correlation or close relationship between the physical traits of identical twins and also between their mental capacities and between their educational abilities.

This means that, if one of the identical twins is tall, the other is the same or very nearly the same height; if one is short, the other is also. If one twin has an I.Q. of 120, the other has about the same. If one twin has an I.Q. of 95, the other has an I.Q. of 95 or thereabouts. In

knowledge of subject matter, identical twins nearly always have about the same standing, both being high, or both being average, or both being low. In the various physical, mental, and educational characteristics or abilities the relationship is very close and is represented by a correlation of about .93, which is a very high one.

Identical Twins Reared in Different Environments. It has happened that identical twins have been separated at birth, one being placed with one family to live and the other being placed in another home. A few pairs of identical twins have been found who had been separated at birth and who therefore had been reared in different environments. The best study of such twins is a report of an investigation of 20 pairs. The investigators tried to discover what effects different experiences had had on their health and physical characteristics, mental age, intelligence quotient, knowledge of various school subjects, and personalities. Of given pairs, one had been raised on a farm, the other in the city, one had lived a pleasant, comfortable life, while the other had had hardships; one had had more years of education than the other. The twins were carefully studied and examined to discover whether or not different modes of living or different experiences had made a difference in their health, physical development, intelligence, and educational abilities.

In some instances, what appear to be different environments do not seem to make a difference. In other instances, different environments do affect identical twins.

The following are some of the differences discovered in the identical twins studied:

One twin girl, who was raised on a farm, was sturdy and weighed nearly 30 pounds more than her sister, who had been raised in the city and did little hard work.

One twin who had lived on a farm as a struggling farmer's wife and the mother of children weighed nearly 10 pounds less than her twin, who had had a comfortable married life. The one who had lived well had perfect teeth, while her twin sister, who had fought poverty on a farm, had teeth missing and decayed.

In the case of an older pair of twins, one had been raised in the "goiter belt," while the other was raised where she had had plenty of antigoiter foods. The one had a goiter, while the other did not; the former was heavier and less alert in moving around.

A twin raised in the city was "citified," while the one raised in the country was "countryfied."

Of a pair, one had had much hardship and consequently felt worried and insecure, while her sister, living in comfort, was much freer of feelings of overconcern.

There were differences in educational achievement and mental age, reflecting a difference in the number of years of schooling. Some twins had had only some grade-school education while their twin sister or brother had had high-school education. There were differences of as much as 3 years in both mental and educational age.

It seems, then, from the study of identical twins reared apart that certain differences in the environment influence the human body either favorably or unfavorably, that human temperament and personality reflect the nature of the circumstances to which they have been exposed, and also that additional years of education reflect themselves in higher mental ages and greater knowledge and information.

Table 6 gives a good summary of the relationship for various traits for three groups of twins: (1) identical twins reared together; (2) fraternal, or unlike, twins reared together; (3) identical twins reared apart. It is normal or natural that twins should be brought up together in the same home, attend the same school, and be together in the same surroundings.

TABLE 6. CORRELATIONS FOR THREE GROUPS OF TWINS*

Trait	Identical	Fraternal	Identical
Standing height.....	.981	.934	.969
Sitting height.....	.965	.901	.960
Weight.....	.973	.900	.886
Head length.....	.910	.691	.917
Head width.....	.908	.654	.880
Binet M.A.....	.922	.831	.637
Binet I.Q.....	.910	.640	.670
Otis I.Q.....	.922	.621	.727
Stanford achievement.....	.955	.883	.507
Woodworth-Mathews.....	.562	.371	.583

* After Newman, Freeman, and Holzinger, 1937.

By comparing the size of the correlations for the three groups the degree of similarity will be readily observed. Note that in physical measurements the pairs of identical twins are very much alike and that the degrees of similarity are about the same for the identical twins reared together and those reared apart. Weight is affected a little by differences in environment, it seems, but other physical traits have been

changed very little. Except for head measurements, the fraternal twins are nearly as alike in physical measurements as the identical twins.

The greatest influence of the environment on the traits shown in Table 6 is on mental and educational abilities. The correlations for the Woodworth-Mathews test should probably not be depended upon, for this is a test of psychoneurotic tendencies such as worries, fears, and complexes and is not so reliable as tests of intelligence and school achievement, which can be tested more accurately.

Identical twins raised in the same homes show a very high degree of similarity in mental and educational tests; the correlation is about .93, the same as for physical qualities. For fraternal twins the correlation is about .74 for mental and educational tests, but for identical twins raised in different environments the average correlation is about .64. It is apparent from comparing the .93 and .64 that being raised in different environments with their different intellectual stimulations and educational opportunities makes identical twins more unlike than if they had been raised together. It is interesting to note that, even though identical twins have been separated, they still are more alike intellectually and educationally than are brothers and sisters reared together in the same families, going to the same schools, and in general having the same environment. The usual correlation of intellectual and educational abilities of siblings is about .50.

These very important studies made of twins show the strength of heredity as well as the powerful influences of environment. The data indicate clearly that the strength of heredity persists but that environment has its effects also. Environment seems to have very little effect on certain physical characteristics but has more effect on measured intelligence and on the knowledge acquired.

SCHOOL ATTENDANCE AND ABILITY IN MENTAL AND EDUCATIONAL TESTS

Adult people of most countries provide schools for their children and for themselves, too. They believe that schools provide one of the best environments for equipping and developing the minds, personalities, character, and health of their children. At this time we shall set forth some evidence that points out the effectiveness of the school in the developing and equipping of the mind.

A study was made in England by Gordon of four groups of children, the physically defective, gypsy, canalboat, and backward classes. The results of the study show that there is a relationship between school

attendance and mental and educational abilities, which as measured are probably to a considerable extent the same abilities. Table 7 shows the

TABLE 7. MENTAL AND SCHOLASTIC ABILITY OF DIFFERENT GROUPS, WITH THEIR PERCENTAGES OF SCHOOL ATTENDANCE*

Group	Average mental ratio (I.Q.)	Average educational ratio (E.Q.)	Average attendance by percentage
Physically defective.....	86.7	86.9	48.0
Gypsy children.....	75.4	77.4	34.9
Canalboat children.....	71.5	71.6	5.0 (estimated)
Backward class.....	74.9	76.9	67.5

* Based on Gordon, 1923.

ratios and quotients. Observe that the ratios tend to be in terms of the amount of school attendance and that the ratios of gypsy and canal-

boat children are even lower than those of backward children. Their intellectual and educational status is low because of absence from school.

Table 8 furnishes more evidence to that effect. It will be observed that, following the age of six, the intelligence quotient is smaller with each succeeding year, thus indicating the increasing penalty with increased absence from school.

These facts are strong arguments for the value of school and tell rather dramatically what the teacher is doing to sustain the intellectual and

TABLE 8. INTELLIGENCE QUOTIENTS OF CANALBOAT AND GYPSY CHILDREN ACCORDING TO AGE*

Age	Canalboat children	Gypsy children
6	86	95
7	79	81
8	76	78
9	73	76
10	68	74
11	64	72
12	59	71

* This table has been based on curves found in Gordon, *Mental and Scholastic Tests among Retarded Children*, p. 54.

educational level of the children. Children grow physically and become larger and stronger, but if it were not for the teacher instructing youth their physical growth would not be accompanied by corresponding mental and educational growth. The data on the canalboat and gypsy children show that very clearly.

THE YOUNGEST CHILDREN IN A GRADE ARE THE MOST CAPABLE AND THE OLDEST ARE THE LEAST CAPABLE

It will be found in a given class that the oldest children are less capable than the youngest in that same class. This is true in spite of the fact that the older pupils have lived longer, have had more oppor-

tunity, and have had several years more instruction and usually a great deal of special help. But their inherited limitations are never overcome, and they are surpassed by younger, brighter children who have inherited greater capacities.

The following data include the average chronological age of a youngest and oldest group and also their years of schooling and average mental age. The latter, mental age, is determined by the scores that the students obtained on general intelligence tests, which have been described in considerable detail in a previous chapter.

COMPARISON OF THE 15 YOUNGEST AND 15 OLDEST BOYS IN A HIGH-SCHOOL CLASS*

	Average age, years	Average number of years of schooling	Average M.A.
Youngest.....	11.7	5.7	16.7
Oldest.....	15.8	9.4	15.1

* Data were provided the author by Royal Embree, Jr.

The older group was, on the average, 4.1 years older than the younger and had had 3.7 years of schooling more than the younger but still were 1.6 years below the younger group in mental level. Additional education and more years of living failed to overcome what no doubt was a basic inferiority of the older group. The superiority of the younger group must have been due to inherent qualities, for time was on the side of the older group. This difference will continue to increase, and when adulthood is reached the two groups will be farther apart than they have ever been.

These are important ideas for the teacher. She must realize that there are these true differences in the ability of children to learn and to respond to the teaching which they receive. Some will grow educationally and intellectually much faster and much more than others. These differences, no doubt, are constitutional. The teacher must learn to deal with children differently, being very patient with the dull and the slow and giving the bright and quick much more to do of an interesting and stimulating nature. She must realize that she cannot overcome nature and that she must work with it for the maximum development of all children.

VARIATIONS IN AVERAGE MENTAL ABILITY OF SOLDIERS FROM STATE TO STATE

During the First World War, the United States soldiers were tested with a mental test known as *Army Alpha*. On this basis, it was possible

to determine the average mental abilities of the soldiers from each of the states. The average mental abilities of the soldiers varied from state to state, and in some instances the differences in the average scores were large.

Investigators were interested in discovering a possible explanation for these variations from state to state. Some have found it in the quality of state school systems. States differ considerably in the average quality of their schools. Some offer their children better educational facilities: the teachers have higher qualifications; the school terms are longer; and the school equipment is superior. The quality of the state school systems has been evaluated according to these and other factors.

A comparison of the rating of the schools of the states with the average standing of their soldiers in the mental tests revealed that there was a fairly high correspondence between the quality of the schools and the tested ability of the soldiers. Thus, the soldiers from the states with the best schools scored highest on the mental tests, whereas those who scored lowest were from the states with the poorest school facilities. This correlation was not perfect, but the trend was very marked.

The foregoing relationship seems to indicate the effect of good schooling on general ability. Accordingly, if the schools of various states are poor, the mental abilities of the people in those states will most probably be poor, but if the schools are good, then the mental ability of the people will be relatively high.

Another point of view may logically be taken. It is that the schools do not create the intelligence of the people but that the people create the schools. Those of less inherent ability or less intelligence will not demand and maintain such good schools as those of superior traits. In other words, the schools are a product of the people, and not the people a product of the schools.

This evidence, like most of the evidence on the contribution of environmental and hereditary forces to human development and capacities, lends itself to a dual interpretation. It is probably closer to the truth in this last instance, as well as in others, to recognize that both types of influence are important. In this last case, one may feel quite certain that the mental abilities of adults taken as groups depend to some degree on the quality and amount of formal education that they have had. On the other hand, it is likewise true that those of superior mental abilities will secure better schools because they will demand them for their children. Cause and effect are not clearly distinguishable. There is, no doubt, a reciprocal relation between the environmental and hereditary factors; one reacts on the other.

Selective Character of Environment. Two psychologists riding in a train were discussing the relative contribution of heredity and environment to human development. As they looked out of the train window, they saw in a cornfield a man driving two horses hitched to a corn cultivator. One psychologist asked the other (no doubt having forgotten that according to popular notion every corn row leads to the White House), "Even if he has marked ability, what chance has that man of achieving greatness?" The other psychologist stated that, if the man had high capacity, he would be so restless in his present environment that he would throw the lines over the horses' backs and seek an environment compatible with his abilities.

For the extremes of ability, this statement is essentially true. It is probable that a person who has transcendent talent for music, sculpture, mathematics, or poetry will not be denied. Such a person will utilize all possible experiences to manifest his ability; and when he finds that his surroundings are not sufficiently stimulating, he will seek a new environment.

A story about Isaac Watts, the great hymn writer, illustrates the persistence of some abilities in spite of adverse circumstances.¹ When he was a child, his unabating versifying annoyed his mother and she attempted to discourage him with a spanking. He pleaded during the process:

Oh mother, on me pity take,
And I will no more verses make!

At the other extremes of ability we have those who are so limited that, no matter how advantageous the environmental stimuli, they will gravitate toward their natural condition at the first opportunity. Such persons cannot be put into a good home without its soon becoming untidy and run-down. Though they are given any number of jobs, they will fail in all of them. If closely controlled, they seem to get along a little better but as soon as the props are removed they revert to their vegetative state. If it were not for the disciplines of social control, they would become delinquents and social problems. Such persons are so heavily laden with liabilities that they gravitate to the bottom. In contrast are those so richly endowed that they rise to the top.

Native Capacity and the Power to Learn. If one believes that the limits of a person's capacity to profit from instruction are fixed by the quality of the genes in the parents' germ cells and the order in which the genes combined, he is likely to adopt an educational philosophy

¹ Reported by Popenoe, *Journal of Heredity*, 20: 422.

consistent with that point of view. He is likely to have a deterministic outlook. He will feel that some are limited by heredity to fewer years of education than others—that, although some should have a college education, others should have only a high-school and still others only an eighth-grade education. The most gifted, he believes, should be guided by teachers and counselors into the professional schools. A tendency exists among some educators to fix inherent limits of educability for students on the basis of aptitude, or intelligence-test, scores.

Serious danger lies in taking too deterministic a point of view. Some pupils from whom only very little is anticipated on the basis of intelligence tests exceed expectations considerably. There is a greater tendency to underestimate than to overestimate, to predict failure rather than success. On the basis of intelligence-test scores, psychologists and teachers may decide that some pupils are not capable of completing their high-school work or of maintaining satisfactory scholarship in college. There is, to be sure, a general correlation between test performances and ability to achieve in various school situations, but without the fullest evidence no one should be dogmatic in any case. Occasionally, a few students succeed very well in spite of the fact that they entered college with poor prospects and with failure predicted for them by nearly everyone. They generally possess special talents and character traits that were either not known or not measurable by the tests given.

Sometimes a teacher may judge as dull and hopeless a pupil who is exceedingly capable. Such a pupil shows little interest in his school-work and proceeds in his own individual and often peculiar way or devotes a large proportion of his time to activities more to his liking. The busy teacher, judging the child only in terms of the usual classroom standards, overlooks his genius and expects him to fail. When in early adulthood he turns out to be a distinguished person, she wonders how a child who seemed so dull in school could have developed so much ability. The fact is that she failed to understand that he had great capacity and consequently misunderstood him.

Counselors and others who engage in guidance and decide for pupils that the classes or the kind of schoolwork that they propose to take is beyond their ability are thus in danger of making serious mistakes. They will be correct in the case of many students, but if they are too arbitrary they will do serious injustice to a number. Heredity may fix varying limits for each pupil, but the limits for each individual cannot be arrived at accurately enough to warrant the counselor's absolute and arbitrary judgment of everyone. We are sure, of course, that a pupil

with an I.Q. of 70 or 80 will not become a lawyer or a member of the other professions, but in less extreme cases we are not sure that all those with low aptitude-test ratings who continue their education will not succeed. A few of those who according to nearly all previous findings are destined to fail will survive educational rigors, and an occasional one will achieve a comparatively high degree of success. The limits of achievement seem to be affected by such a number of factors that we cannot be sure of what they are in a specific situation. Most errors can be avoided if those who guide and direct pupils allow, within reasonable limits, a period of trial instead of judging them with absolute finality.

The Teacher, the School, and the Child. Now that we have discussed the nature-nurture problem, what lessons shall we draw for the teacher and the school? In the first place, we can be proud of the importance of the opportunity that the school has in developing the child's character, his personality, his health, and his intelligence. The school can be a good one that will do much for the student or a poor one that will do little for him or that may even do him harm.

A good school will have a good health service. The classroom teachers should be conscious of the health needs of their pupils; by vigilance they can do much for the health of their students.

A school with good discipline in the modern sense, or good control of behavior with its consequent good morale, can do much for the personality and behavior of its pupils. It can develop mannerly, well-behaved youngsters or the opposite.

Good teaching as against poor teaching can make the difference between well-informed and educated and poorly educated pupils and can develop a curiosity about learning and a sharp interest in it instead of cold indifference. Thus, definitely and indisputably, the influences of a good school are favorable, while the poor school with its poor teachers affects the pupils adversely.

However, in spite of its good effects on the pupils, the good school will still have its failures. The children will still become sick, and some more often than others. Some children will still misbehave and some develop poor personalities. Children will still have poor habits no matter how great the teacher's efforts to inculcate good ones. Pupils will still differ widely in intelligence, and it is doubtful that the good school will effect any change whatever in this range. Children will also differ greatly in the amount they learn, and this will hardly be affected by good teaching. Even in the best schools there will be graduated some pupils who are dull and poorly informed, and in the poor schools there will be graduated very bright pupils and some who have a fairly good

and even an excellent education according to the standards of the grade from which they were passed or graduated.

All this must be granted, but we must recognize that the evidence on the influences of environment indicates that good teachers and good schools can have very good effects on the group as a whole and on some individuals in particular. The teacher should be proud of her opportunities to influence her pupils favorably. In the case of some children, she can change carelessness to carefulness, indolence to diligence, and ignorance to understanding, and can cause a child to love or hate school life.

SUMMARY AND REVIEW

Teachers who have an extreme hereditary point of view will have a deterministic attitude toward their pupils. Those who have an extreme environmental point of view may be overoptimistic about what they can do for their pupils. A teacher should cultivate a balanced point of view based on the facts.

Inheritance involves the transmission of traits through the chromosomes and genes of the father and mother.

When the genes are uniform in their quality, they are said to be *homozygous*. When the genes vary, they are said to be *heterozygous*.

The human race would be greatly improved if weak and incompetent persons did not have children. However, there would still be deficiency, for a few inadequates would be born to persons who were average and better.

Congenital influences are those which affect the embryo and fetus. Some physical conditions of the mother can affect the embryo and fetus; her thoughts and wishes cannot.

Three interrelated principles of inheritance are that like tends to beget like, that there is variation in the offspring, and that offspring of parents who deviate considerably from the average tend to regress toward the average.

A child's inheritance is from all its ancestry, but most from the parents, and decreasingly less as the relationship becomes more remote.

Either outstanding strength or outstanding weakness tends to run in family lineages. A child of superior heredity is usually nurtured in a superior environment. A child of inferior heredity is usually nurtured in an inferior environment.

The closer the blood relationship, the closer the relationship in abilities and characteristics.

The occupation of a person indicates in general his capacity, and it

has been found that the intelligence of children tends to accompany the occupational status of the fathers.

It has been demonstrated in the case of rats that selective breeding results in almost complete separation of the best and poorest.

Foster children reflect the influence of their foster homes in their intelligence quotients, school progress, and behavior. The most beneficial effects seem to be on their behavior.

When identical twins have been reared apart in different environments, their general health, educational and mental status, and temperaments seem to reflect differences in experience. Physical characteristics such as height and head sizes are not affected.

When children are absent from school a large proportion of the time, their educational and intellectual status seem to suffer about equally and to a considerable degree.

In a given grade the youngest child who has had several years less education is more capable than his older classmate who has had several years more education. These differences are caused by fundamental differences in their native capacities.

The mental-test scores of soldiers according to the states from which they came tended to correlate with the quality of the schools of those states. Either good schools increase the intelligence of its people, or people of higher intelligence develop better schools.

There are no doubt true and fundamental differences in the capacities of school children, but there is a good education for all children, and the school should try to bring about the optimum development of each child.

Test Your Thinking

1. Knowledge of heredity and environment is unimportant to the teacher and does not concern her. Comment on this statement.

2. In family A there are five children, all of them healthy and very bright. In family Z there are six children, all of them dull, having I.Q.'s in the seventies. Discuss in terms of genes, homozygous and heterozygous.

3. Marked differences in the physical, emotional, and intellectual qualities of the children of some families have been pointed to as being among the strongest evidences of hereditary forces. Comment.

4. Describe some scheme, either practicable or theoretical, for improving human beings. Take into account both environmental and hereditary factors.

5. Good heredity and good environment go together, as do poor heredity and poor environment. Show how this complicates the problem of trying to analyze the individual effects of heredity and of environment.

6. Do you think human beings could be improved by selective mating? Explain your answer.

7. Can a good foster home overcome the deficiencies caused by the poor heredity of the foster child? Discuss.
8. The study made of identical twins reared apart has probably provided the most reliable evidence on the nature-nurture controversy. Why is this so? Evaluate the findings.
9. How does the study of canalboat and gypsy children show that school is essential for children if they are to develop their intelligence?
10. Does not the fact that the oldest children in a grade are the dullest show that you "can't pound knowledge and abilities into their heads"? Discuss.
11. How do you account for the fact that Benjamin Franklin, Mark Twain, Thomas Edison, Abraham Lincoln, and other eminent men had no special advantages as children and reached such great distinction?
12. How can the teacher and the school do the most possible for the pupils?

References

- BRADWAY, K. P.: An Experimental Study of Factors Associated with Stanford-Binet I.Q. Changes from the Preschool to the Junior High School, *Journal of Genetic Psychology*, **66**: 107-128, 1945.
- CRISSEY, O. L.: Mental Development as Related to Institutional Residence and Educational Achievement, *University of Iowa Studies, Studies in Child Welfare*, **1**: 13, 1937.
- GALTON, FRANCIS: *Hereditary Genius*, Macmillan & Co., Ltd., London, 1869.
- GESELL, ARNOLD: The Biography of a Wolf-child, *Harper's Magazine*, **182**: 183-193, 1941.
- GODDARD, H. H.: *The Kallikak Family*, The Macmillan Company, New York, 1912.
- GORDON, HUGH: Mental and Scholastic Tests among Retarded Children, *Educational Pamphlets* 44, Board of Education, London, 1923.
- JENNINGS, H. S.: *Biological Basis of Human Nature*, W. W. Norton & Company, New York, 1930.
- MANDELBAUM, D. G.: Wolf-child Histories from India, *Journal of Social Psychology*, **17**: 25-44, 1943.
- Nature and Nurture, *The Twenty-seventh Yearbook of the National Society for the Study of Education*, Public School Publishing Company, Bloomington, Ill., 1928.
- NEWMAN, HORATIO H., FRANK N. FREEMAN, and KARL J. HOLZINGER: *Twins: A Study of Heredity and Environment*, University of Chicago Press, Chicago, 1937.
- POOPENOE, PAUL: The Inheritance of Artistic Talents, *Journal of Heredity*, **20**: 415-423, 1929.
- SCHWESINGER, G. C.: *Heredity and Environment*, The Macmillan Company, New York, 1933.
- SINGH, J. A. L., and R. M. ZINGG: *Wolf Children and Feral Man*, Harper & Brothers, New York, 1942.

- SKEELS, H. M.: Mental Development of Children in Foster Homes, *Journal of Consulting Psychology*, **2**: 33-43, 1938.
- SKEELS, H. M., and EVA A. FILLMORE: Mental Development of Children from Underprivileged Homes, *Pedagogical Seminar and Journal of Genetic Psychology*, **50**: 427-439, 1937.
- SKEELS, H. M., RUTH UPDEGRAFF, BETH L. WELLMAN, and H. M. WILLIAMS: A Study of Environmental Stimulation: An Orphanage Preschool Project, *University of Iowa Studies, Studies in Child Welfare*, **4**: 15, 1938.
- SKODAK, MARIE: Children in Foster Homes: A Study of Mental Development, *University of Iowa Studies, Studies in Child Welfare* (No. 1), 1939.
- SKODAK, MARIE, and HAROLD M. SKEELS: A Follow-up Study of Children in Adoptive Homes, *Journal of Genetic Psychology*, **66**: 21-58, 1945.
- SNYDER, LAURENCE H.: *The Principles of Heredity*, 3d ed., D. C. Heath and Company, Boston, 1946.
- SPEER, GEORGE S.: The Intelligence of Foster Children, *Journal of Genetic Psychology*, **57**: 49-55, 1940.
- TERMAN, L. M., and others: *Mental and Physical Traits of a Thousand Gifted Children* (*Genetic Study of Genius*, Vol. I), Stanford University Press, Stanford University, Calif., 1925.
- THEIS, SOPHIE VAN SENDEN: How Foster Children Turn Out, *New York Publications* 165, State Charities Aid Association, 1924.
- TRYON, R. C.: Individual Differences, in *Comparative Psychology* (ed. by Moss), Prentice-Hall, Inc., New York, 1934.
- WELLMAN, B. L.: The Effect of Preschool Attendance upon the I.Q., *Journal of Experimental Education*, **1**: 48-69, 1932.
- WELLMAN, B. L.: Growth in Intelligence under Differing School Environments, *Journal of Experimental Education*, **3**: 59-83, 1934.
- WELLMAN, B. L.: The Intelligence of Preschool Children as Measured by the Merrill-Palmer Scale of Performance Tests, *University of Iowa Studies, Studies in Child Welfare*, **3**: 15, 1938.
- WINSHIP, A. E.: *Jukes-Edwards: A Study in Education and Heredity*, Meyers, Harrisburg, 1900.
- ZINGG, R. M.: Feral Man and Extreme Cases of Isolation, *American Journal of Psychology*, **53**: 487-517, 1940.

CHAPTER XIII

THE PROGRESS OF GROWTH AND DEVELOPMENT THROUGH LEARNING

What to Look For. Note the factors, time, effort, and variation, in relation to the internal and external factors that influence the course of learning.

Learn the characteristics of the learning curve that are described as concave, convex, concave-convex, and the plateau.

What are the factors in learning that make for these various phases and characteristics of the learning curve?

Learn what the factors are that cause a plateau. How can a plateau be overcome?

What are the practical, optimum, and theoretical or physiological limits?

How is level of maturity, or maturation, a factor in learning during the growing years? Comprehend how growth during the childhood years is such a helpful ally of learning. Learn the features of the learning experiments with identical twins.

How have adult abilities and the abilities of adults to learn been tested? Formulate some opinions about the trend in abilities during the adult years.

Introduction. "It seemed that for the first few months we studied German we made no progress at all," said Gwen.

"We were laying the groundwork, and after we had done that we made rapid progress in learning to read and speak the language," replied Greg.

In discussing basketball, Dick, one of the regulars, remarked that he didn't think he was getting any better in throwing baskets.

Tom replied, "When I find I'm not making any improvement, I try harder or I change my method. If that doesn't help, I stay away from practice for several days."

"But a time will come when we can't get any better no matter how hard we try," added Ray.

"Yes, and after a period of no improvement a decline sets in. That takes place after you reach a certain age, probably in the late twenties," commented the coach.

Factors Affecting the Learning Curve. Curves representing the development and acquisitions of learners follow interesting courses. Try to visualize, for instance, a curve depicting the acquisition of vocabulary from birth to old age, or throughout the span of life. Similarly, what is the growth in various sensorimotor abilities some of which we acquire incidentally and some through special effort and practice? What is the course of learning for children, as a whole and individually, from kindergarten up through the eighth grade, high school, and college? At present, there is increased interest in the direction that learning takes throughout the adult years from maturity to old age. Curves representing growth and development may represent a composite of many abilities, or they may represent the growth of more specific abilities such as reading, arithmetic, language, and history.

This introduction to the topic of growth through learning has stressed development over a long period of time. Important, also, is the nature of development over a shorter period. For example, if individuals practice typewriting for several months, the curves depicting their increase in speed and accuracy show definite trends. In an attempt by persons to learn a language, to develop ability in tennis or golf, to acquire a trade, to play the piano, to give a mental examination, and to gain proficiency in bridge the course of learning can be depicted and described graphically. The learners would go through various characteristic experiences. In the beginning, their progress might vary. Initial learning would be slow in some instances and more rapid in others. In the course of nearly all learning a time is reached when no progress is made for a time, when the learner seems to be at a dead level. Generally, he improves and emerges from the period of no growth to reach eventually a point where no matter how hard he tries he can improve no further.

If a chart is made of day-by-day learning and performance, great variations in efficiency will be found. On one day, a pupil will be twice as efficient as on another, problems that are difficult at one time will be much easier at another. Fluctuations in individual abilities are characteristic of all and cannot be avoided. Baseball players bat, field, and pitch better on one day than another; lecturers express themselves better at different times; workers vary in their efficiency from day to day; and, in general, pupils learn more readily on some occasions than on others.

Variation in achievement is the rule and cannot be avoided, for many factors and conditions influence performance and cause these variations. To a considerable degree these conditions are physiological

or internal, but there are also factors external to the person himself. Some of the personal, or internal, factors are capacity, fatigue, emotional conditions, and health; external factors are difficulty of material to be learned, incentives and motives, weather conditions, noise, and other distractions. The combinations of these factors vary from day to day and influence achievement correspondingly. When the combination is most favorable, efficiency is highest; when it is least favorable, efficiency is lowest. Each person has an average level of performance

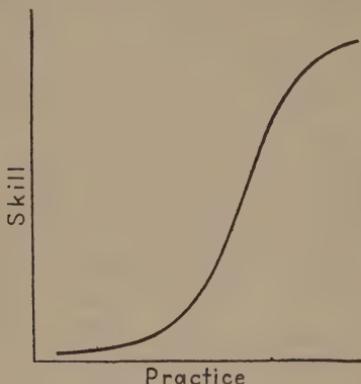


FIG. 16. Concave-convex curve.

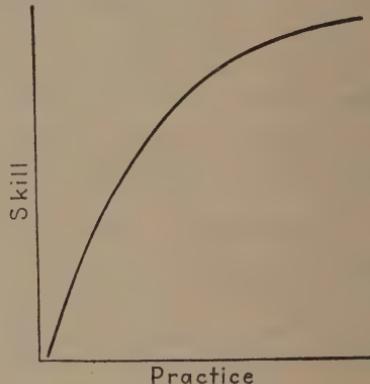


FIG. 17. Convex curve.

that is characteristic of his particular efficiency. There are fluctuations about this average, influenced by the factors that have been mentioned.

THE LEARNING CURVE

There really is no single learning curve. So many factors influence the direction taken by learning that there are many learning curves. Learning curves vary from person to person, from school subject to school subject, according to whether the learning period is long or short, the materials hard or easy, and according to the manner of drawing the curves or their arrangement. Even though there is great variation, however, certain characteristics of the course of learning should be discussed as general principles. In a general way, the curve of learning may be divided into three sections: the beginning, the end, and the portion between the beginning and end. This classification is oversimplified, of course, but is useful for setting forth some of the principles pertaining to the development of skills and abilities.

Slow Initial Start. In order to have something concrete to describe, we shall discuss two simple learning curves (Figs. 16 and 17). The initial progress according to Fig. 16 is slow. Apparently, little is

gained at the beginning. This is typical of the progress of a child in learning to read or an adult in learning a difficult foreign language. There is a period of weeks and sometimes months in which no perceptible progress is being made. A few words are being learned, but little development of the ability to read from the printed page is apparent.

Following a period of no apparent growth, there is a rise in the curve, representing a rapid measurable increase in ability. This growth is maintained for a period of time and is represented by the more nearly vertical part of the curve. After a while, however, the improvement slows down and then stops. The period of greatly reduced gain following rapid learning is represented in Fig. 16 by the upper part of the curve.

This type of curve represents the growth of various abilities. The growth of a child's reading ability is depicted in a general way by Fig. 16. After the initial phase of no apparent development there is a rapid rise of ability, which reaches at some time in the teens a period of little or no improvement. Ability remains quite constant thereafter. Much of human learning and growth takes the course illustrated in Fig. 16. For example, the curve depicting the growth in the walking ability of infants resembles it. For nearly a year there is apparently little increase in walking ability, although, of course, the development of the physical structure involved in walking is taking place. After a child begins to walk, his ability increases rapidly; but a time is reached when there is little improvement. Similarly with the development of vocabulary. There is no apparent learning of words until a child is about twelve months of age. Then his acquisition increases rapidly until maturity is reached, when very little, if any, further growth of vocabulary occurs. The part of the curve representing the period of no growth or development is flat, and therefore this period is called a *plateau*.

In learning almost any material that is difficult for the learner the initial progress is extremely slow. Apparently, it takes a long time to get started. Slow initial improvement characterizes the learning of hard problems in mathematics, an unfamiliar language, learning to play the piano, or the acquisition of any skill and ability that seems to defy for a time the attempt to acquire it.

Examination of the lower half of the curve reveals that part as being concave. The upper half is convex. A curve is concave when the rate of learning is increasing. It is a curve that depicts a period of more rapid learning following a period of slow improvement. Obviously, a learning curve cannot be concave if the entire course of learning is depicted, for it is impossible for the rate of learning to increase in-

definitely. It must slow down in approaching a period of no improvement and then ultimately reach that period. No one can continue to improve indefinitely in every given function. A person can take up a new subject or attempt to acquire a new skill, and he will manifest improvement, but ultimately he will reach a plateau from which he cannot emerge to a higher level. A pupil reaches at some time the limit of his ability to compute arithmetically; the typist reaches a point where, no matter how hard he tries, he cannot type more rapidly or more accurately; the musician reaches a point where his playing does not

improve—he can learn new pieces, but the quality of his performance does not become better. Similarly with all our learning—there are limits beyond which we cannot go. But it must be remembered that we seldom reach our limits; and in many fields, our learning has not developed even past the initial stages.

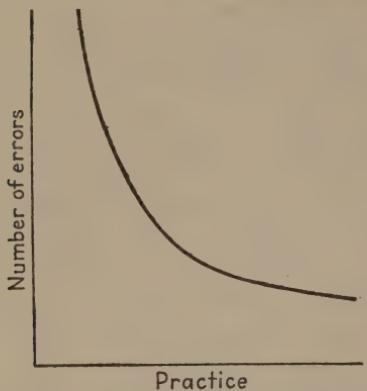


FIG. 18. Decline in errors with practice.

much learning. There are, of course, many individual variations. Fluctuations characterize individual curves, and only summary or average curves are free from irregularities. Then, too, plateaus occur for short periods, which are not shown by a curve that depicts the progress of learning over a long period. The courses taken by curves depicting the acquisition of skills over shorter periods of time will be discussed later.

The curve can be reversed if the mode of representation is changed. For example, if instead of showing the amount acquired the number of errors is recorded according to successive practice or according to time, the curve will start high and go down as the number of errors decreases. Figure 18 is this type of curve; it shows improvement by its descent.

Rapid Initial Start. Figure 17 represents a learning curve in which initial progress is rapid. Improvement is rapid from the beginning and continues for a time, after which it slows down at the level where no further improvement occurs. The curve, as given, is a convex one, representing rapid initial learning that slows down with time. A learning curve is generally convex when the learner brings to the problem

a capacity and initial ability that enables him to progress rapidly from the start. In such instances, learning does not begin at the zero point, and the slow initial phases have probably been overcome by the previous acquisition of abilities. When this is the case, learning appears to increase rapidly from the beginning, whereas in reality the slow initial phases have been overcome by previous learning.

In learning to skate, for example, we bring to the problem of acquiring that skill all the sensorimotor abilities that we have acquired in learning to walk and in maintaining our equilibrium. In learning to play quoits a person begins with tossing skills that he has acquired in other games; consequently, learning is more rapid than it otherwise would be. Similarly, when a person starts to learn algebra after having studied arithmetic a number of years, when he approaches geography and history after having had several years of reading experience, initial progress is more rapid because of allied experiences. In general, we begin few tasks without some preparation that will cause rapid initial learning.

In learning material that is intrinsically difficult or difficult because it is unfamiliar the curve depicting progress of learning will not show a rapid initial rise. If one is trying to solve difficult puzzles, there is little growth at first but the solution often comes rapidly after a period of no apparent progress. In attacking difficult problems in arithmetic and algebra the progress is very slow at first, but a time usually arrives when one seems to get an insight into their solution, and then progress is rapid. The curve depicting such progress in learning is concave until it tends to flatten out and adds a convex portion, thus becoming concave-convex. This curve is different from the one in which the initial progress is rapid, in that the latter does not have the concave portion and is only convex. Reference to Figs. 16 and 17 may help clarify these various concepts that have been set forth.

Another explanation for the rapid initial rise in the curve is found in the fact that the tasks or problems are novel when first attacked. Greater progress is made until interest wears off. Not always, however, is the learner as interested in the beginning as he becomes later when he increases his efficiency. In the acquisition of many of our abilities and habits, it is first necessary to go through much discouraging work before the development of facility stimulates us to work with zest.

Plateaus. Periods of no visible progress are called *plateaus*. The portion of a learning curve that depicts a plateau is the flat portion. The flat parts of the learning curves between their end portions are considered the plateaus, although the initial portion, representing very

little increase, and the final portion, if showing no growth, are also plateaus. During the period of the plateau there is no apparent growth or improvement in learning. When the pupil does not improve in his reading, when the piano student's playing seems arrested, when the gymnast is not bettering his performance, and when the speech student shows no improvement, we have examples of plateaus. They generally last during the learning period for days, weeks, and months, as is implied by these examples; but plateaus also occur in the development of abilities throughout a substantial portion of even the whole of a lifetime. There are periods between initial development and the ultimate limit when the course of learning remains relatively flat.

In this discussion we shall not consider as a plateau the end portion of the learning curve, for this probably represents the limit of improvement for any particular person. The limit of improvement will be discussed separately. The explanation for periods of no apparent improvement between the initial and end phases of the learning will now be discussed.

A learner may be on a plateau because of fatigue or boredom. Boredom is probably the more important factor. If the learner loses interest, becomes perfunctory, or falls into a mechanical routine, he is likely to be on a plateau. Sometimes there are periods of a month or more when a pupil makes no progress in his subjects. He appears bored and uninterested; but, after a period of no gain, something seems to happen that causes a spurt in his achievement to take him off the plateau. These plateaus, or periods of no gain, almost always occur unpredictably, and their termination is largely unpredictable, also.

Another explanation of the plateau is that during its period the learner is acquiring a higher form of response. He is emerging from a simpler and less effective form of learning and response to one that is more complex and efficient. In reading, for example, the pupil is learning to combine the phonetic parts into words or the words into phrases. There will be an upward swing from the plateau when the pupil has succeeded in making the larger combinations. In arithmetic the ability to add shows improvement when the learner is able to add several numbers at a time rather than one number to another. Multiplication may show improvement when the teacher helps the pupils with their specific difficulties in carrying. A person who may have used the simple one-finger "hunt-and-peck" system of typewriting may experience a plateau in trying to learn the touch system, which involves all fingers and requires that the typist does not look at the keys. No improvement may be in evidence at first, and performance may even

be poorer for awhile; but, after a period of practice, skill will reach a higher level. Also, a person may be on a plateau in the levels of his thinking until he can generalize his facts into principles and, in turn, apply the principles to specific situations. Formerly, he treated his facts as more or less isolated and did not integrate them into logical conceptual patterns. Thus, a learner may be on a plateau while he is making a transition from a lower to a higher level of performance.

We have been speaking of levels of performance varying in complexity from the simple to the complex. This is often referred to as the *hierarchical organization*. The simpler emerges into the more complex, which, in turn, becomes reorganized into still more complex and effective behavior. Hierarchical organization is apparent in most logical arrangement of subject matter, as in mathematics, which ranges from the simplest addition to the most complicated mathematical equations of an Einstein. The simple is progressively organized into the more complex until the organization becomes so complex that only a few can comprehend it. Learners vary in the level beyond which they can go. Some with little capacity go hardly beyond the simplest levels; most reach the average; a few are capable of the highest reaches. According to the theory of hierarchy of performance, the plateau is a period when the learners are making the adjustments for emerging into a more efficient and complex type of performance.

In the development of any field of learning or the acquisition of skill a place in the curve will be reached where the complexity of knowledge or skill causes a considerable slowing down. This is represented by the flattening out of the curve.

Partly related to this factor of increasing complexity is the amount of improvement that remains. At the beginning, all is in front, so to speak; but as the learner progresses, the possible amount of material to be learned decreases. Complexity usually increases, also, but the percentage to be learned diminishes, and consequently the rate of growth slows down. The flattening of the curve often represents the approach of a point where a practical limit is being reached.

A student may be arrested in his progress because the work is too complex or hard for him. At this point the teacher can be of great help by observing carefully the recitation, written work, and examinations of the pupils and detecting the parts of the work that give the individual pupil trouble. She can also encourage her pupils to ask questions and to bring their special problems to her attention so that she can help them with the parts that are blocking them. Many situations may be like a tangle in a skein of yarn; when it is untangled, the winding

of the yarn into a ball can continue rapidly until another tangle has to be loosened. Similarly, the teacher can untangle the knotty problems of her pupils and thus keep them progressing academically and personally.

The teacher should watch her pupils in order to detect bad habits and a lack of interest, two factors that often go together. There is often the bad habit of not studying enough and not having good habits of study. Specific habits such as moving the lips while reading, moving the eyes back and forth too often over the same lines, and reading too slowly should also be looked for. Talking to the child is not enough. It may help a little, but what is needed is a remedial program for the child that will liberate him from his faults and thus free him to move ahead. The teacher at all times must keep in mind the learning capacities of her children and recognize the great range of capacity in any given class.

A student will be on a plateau when he feels that he has no motive or purpose. Then he does not try very hard, for he feels there is no point to it. He may not even stay on a dead level very long but may actually lose ground.

When students seem aimless or without motive, the teacher should talk with them and show them why they should engage in various activities and why they should master the subject matter in which apparently they have no interest. One of the purposes of guidance and counseling is to show the pupils why they are doing what the school guides them to do and why they should master certain subject matter. When students see the reason for what they are attempting to do and then are helped so that they are able to do it, they usually make progress.

In a discussion of plateaus, it is often asked whether or not they can be avoided. Is there a method of preventing their occurrence? They seem to represent a loss, and it would seem desirable to avoid them so that learning may progress steadily. There probably is no way of entirely preventing plateaus, but they may be lessened in number and shortened in duration if the learner is highly motivated and his interest well maintained. It is impossible to maintain interest continuously at a very high pitch; even if it were, it is doubtful that all periods of no improvement could be prevented.

The best recommendation that can be made for preventing plateaus is for the learner to cease practice when he is failing to show any betterment in his performance—in short, take a few days off or turn to a different task. When a person seems stale or unable to make progress and his efforts in certain directions lead to nought, he should cease trying and utilize his time doing something else. He is on a plateau

and will probably make as much progress in the end if he abandons the work for a time, for he may progress from the start when he comes back to it.

In an experiment with ball tossing, Miller¹ avoided the plateau for some of his subjects by having them discontinue practice for a time when it was apparent that they were showing no improvement.² Those who continued their practice without interruption and worked through their plateau, so to speak, made no more progress than did those who had less practice as a result of stopping it temporarily when they entered upon a period of no improvement. If it is a fact that taking time out avoids the plateau, then it would seem that the plateau is not necessary for effecting the reorganization of the simpler processes into a more complex response. During the plateau, certain inhibitory factors or poor techniques probably drop out, and time may be the factor that is responsible rather than practice.

In a general and empirical way, we know that we progress most if we take time out from our work. During the year, we arrange to have vacations so that we can return to our work more efficient than before. People avoid falling to a dead level of achievement by taking on hobbies; obtaining a year's leave of absence from their work; or, in general, getting into a different environment and developing new interests. Empirically, we know that efficiency and interest in one's work are maintained by absenting oneself from it for shorter or longer periods. Similarly, when viewed more narrowly in terms of acquiring skills and abilities over a shorter time, it is consistent with known facts that plateaus can be avoided if the learner discontinues practice when a period of no improvement is reached. If he cannot take time out from his work, he should get special help or change his methods. If the old way does not work, try a new way.

Limits of Improvement. In acquiring any skill or ability a person reaches a limit beyond which he cannot go, no matter how hard he tries. In the growth of an individual's reading ability a time is reached when ability to read rapidly and understandingly does not improve. Also, there is a limit to the speed with which a pupil can multiply, add, subtract, and divide; write words and numbers; operate a typewriter; sew with a needle; plane a board; or draw a line. In these activities, a limit of improvement is soon reached.

When the simpler skills are involved, it is easy to comprehend the

¹ Unpublished research by W. S. Miller.

² The object of the learner is to keep tossing and catching balls, generally two of them. When he misses the ball or has to catch both of them or if one ball is not in the air, an error is counted. The number of tosses between errors gives the score.

limits of learning. We realize that the maximum scores obtained by individual children and adults in the simpler arithmetical processes are reached after a comparatively short time. It is apparent that in typing, tennis, golf, and other sensorimotor activities a limit of improvement is reached. This is called the *physiological limit*. There is a limit in the facility with which the eyes can move in the case of reading, the fingers in typewriting, the legs in running, and the speech organs in speaking. In the learning of skills, limits of improvement are more apparent than in the acquisition of the more abstract powers.

When the more abstract materials are involved, it is not so easy to realize the limits of improvement. It would seem possible for all people to continue throughout life acquiring more words, increasing their fund of historical and geographical knowledge, and improving their abilities in mathematics. However, an equilibrium is reached when the amount acquired equals the amount forgotten or lost, and then the limit of improvement has been reached.

In acquiring knowledge and understanding the physiological limits of the movement of eyes, hands, legs, and speech organs are not involved so much as they are for an athlete, typist, and factory worker. A person acquiring knowledge is limited by his intellectual capacity and also by his needs, and consequently the physiological limit is not involved so directly as it is for those who depend on the movement of the body and its parts for their efficiency. The relation of physiological limit to various learning situations should still be kept in mind, however.

Limits of learning involving both sensorimotor and abstract materials vary from person to person. Some have very high limits; most have moderate or average limits; and some have limits that are very low. These limits of learning capacity may be described as the altitudes of each person's power. Even though each individual has an altitude or limit, he very seldom reaches it. Each person in practice reaches a limit below his actual, or physiological, one. This may be called the *practical limit*. The distance from the practical to the theoretical varies from person to person and also according to the kind of material learned. Some pupils may expend a maximum effort and approach their theoretical limit more closely than others who try less hard. The *theoretical*, or *physiological*, *limit* is the limit reached when a person is highly motivated and expends all the energy that he possesses in learning the problems or tasks that he is trying to master. Children preparing for an important spelling contest with intensive drills and practices are probably learning at their maximum limits, whereas the boy who is routinely preparing his lessons is far from his limit. When students

cram for their examinations, their learning is at their maximum; but, in the end, the amount that they have learned does not approach the limit of their capacity. The limit a person reaches by efficient work habits, by the most efficient management of time and effort, is the *optimum limit*. This is between the practical and the theoretical limit.

Thus, it is well to differentiate between learning or performance at maximum for a short period and the reaching of one's limit in any given activity or subject. A child may for the day be doing his very best in silent reading but may not have reached the extreme limit of speed and comprehension of which he is potentially capable. Similarly in writing, woodwork, history, art, or any other activity or field that may be mentioned. It is rare that anyone is learning according to his full potentialities in more than a few instances, as in music, spelling, games, and sports, or other subjects and activities when the motivation or competition is very strong.

Furthermore, it is doubtful that a child or adult should be keyed up to a point where he reaches his limit of learning and performance. In limited areas, one may devote his maximum efforts to learning and performance. A musician's, actress's, surgeon's, golf player's, or lecturer's specialized performance should reflect a maximum of effort and learning, but a pupil or teacher should not be expected to reach his potential limits in all that he does. The former need be at his limits for shorter periods and even then often performs at a level below his maximum. On the other hand, the pupil and teacher continue over a longer period involving more varied activities and cannot be keyed to maximum learning at all times. Their practical limit should be as high as possible consistent with good living. If pupils and teachers worked to maintain a learning level equal to their potential limits, they would develop nervousness and ill health. Learning should be maintained at an optimum level consistent with good emotional adjustment. Many pupils and teachers are at a level much below the optimum one. These should be motivated to greater efficiency. Others strain themselves by attempting too much learning; they should adjust to a more practical limit.

AGE, MATURITY, AND LEARNING ABILITY

In dealing with the topic of age and maturity in relation to learning, it is well to discuss two phases. The first is age in relation to learning up to the period when mental and physical maturity is reached; the second pertains to learning after that stage of development. Age is a much more important factor in learning during childhood than during

adulthood. A few years in the age of a child make a tremendous difference; but in the case of an adult a few years probably matter little.

Age and Learning up to the Period of Mental Maturity. Figure 8 depicts the general nature of mental growth. The precise age when mental growth stops because of the cessation of maturational processes is still a matter of controversy. Some psychologists believe that mental maturity is reached at the age of thirteen or fourteen, whereas a few think that they have discovered growth extending through the late teens and into the early twenties. The experimental evidence indicates that the rate of mental growth after fifteen or sixteen is comparatively slow. The period when the annual increments of mental growth are greatest merely from growing older are the preschool and elementary-school periods of life. During high-school years, growth through maturation is much slower, and it may be considered as reaching its limit during the college years.

During the preschool and elementary-school years, however, a child matures greatly during a single year. Tasks that he finds too difficult at six he can achieve at seven, and finds easy at eight. The type of exercises that are included in intelligence tests may be graded so that of five-year-olds only 35 per cent but of six-year-olds as many as 70 per cent will pass. The percentage of successive age groups who pass tests of their age levels increases rapidly from age to age during the earlier years, for growth through maturation is most rapid before the teens are reached. The increase in the percentage of boys and girls in the teens who pass test items is much less from age to age than that of younger children.

The factor of age is consequently very important educationally. If a child cannot learn to read at the age of six, he can probably learn at seven or eight, unless his rate of mental growth is extremely slow. If his mental level is not high enough at the chronological age of seven or eight, it may be adequate at a higher age. In the case of some children whose I.Q., or rate of mental growth, is very low, a level adequate for learning to read is never reached. The mental level, or M.A., of a pupil indicates in a general way what he is able to learn. The C.A. of children is important in the sense that, with an increase in age, an increase takes place in mental capacity. The amount of increase is indicated by the I.Q. A child with an I.Q. of 150 grows 1.50 years mentally in a chronological year and consequently has the capacity for doing a number of tasks at the end of a calendar year that he could not do at the beginning. A child with an I.Q. of 75 will increase only .75 of a mental year, or one-half as much as the child with an I.Q. of 150. The duller child has

not improved much from one birthday to the next and, therefore, has not increased his mental power enough to be able to learn much more readily than the year before. At the end of 2, 3, and 4 years, however, the total amount of mental increment is enough to be important educationally. Widespread recognition of the differences in rate of development would bring about the organization of a separate educational program more suited to the capacities of these slower children.

Growth, Maturation, Training, and Ability. An approach to the problem of testing the importance of maturation in human development was made by Gesell and Thompson and also by Strayer. They used a pair of young identical twins in order to examine the effect of increasing age, or maturation, on physical and mental abilities. Because the twins were identical, one could be used as a control against the other. If one were trained differently from the other, any observable differences in their behavior and abilities could be ascribed to differences in training. In the experiments referred to, attempts were made to determine the effect of maturity on motor and language abilities.

In the first experiment the twins were about a year old, and they were tested for their ability to climb five steps. Twin T was given more training and practice than the other, designated as twin C, the letter symbolizing the word *control*. Twin T was given 6 weeks of training in climbing stairs. The training began when she was forty-six weeks old and ended when she was fifty-two weeks old. Twin C was given only 2 weeks of training but began at the age of fifty-three weeks and therefore ended at the age of fifty-five weeks. It is important to note that twin C was 7 weeks older when she began her training than twin T had been. Twin C was given 4 weeks less training but was 3 weeks older when the training period ended. In short, twin T was given more training, but twin C was older. The investigators wanted to discover whether or not more training at a younger age will develop more motor ability of the kind needed in climbing stairs than less training at a greater age; in other words, they were interested in the question of training versus maturity.

The results indicate that being older outweighs the advantage of longer training. Gesell and Thompson summarize their results as follows: "The climbing performance of twin C at fifty-five weeks was far superior to the climbing performance of twin T at fifty-two weeks, even though twin T had been trained 7 weeks earlier and three times as long. The maturity advantage of 3 weeks of age must account for this superiority."

The comparative effect of maturity and training on the grasping

and manipulative ability of the twins was tested in a similar manner. In this phase of the experiment, cubical blocks were used. The ability of the twins to manipulate the blocks was systematically observed. As in the previous experiment, the twin whose training period began later and was shorter manifested superior skill.

Using the same pair of twins¹ and essentially the same technique, Strayer examined the effect of training and maturation on language development. Twin T was given 5 weeks of training, which continued through her eighty-eighth week of age, and twin C was given 4 weeks of training, which began at the age of eighty-nine weeks. The difference in the amount of training was only 1 week, but it began for twin C about the time when it ended for twin T.

The language training consisted mostly in naming pictures and objects, following directions, and the association of words with behavior, such as "How do you do?" with shaking hands. While twin T was being trained in language, twin C was not spoken to. In this experiment, also, maturity, or age, determined ability to a greater extent than did training. Twin C showed a superiority over twin T, thus indicating that, in verbal development, maturity with less training results in more learning than does more training with less maturity.

Not all results substantiate those given. In some instances where identical twins were raised together and one was given special training with the purpose of developing mental and sensorimotor abilities, there was a marked difference in the abilities of the two. The one trained had decidedly greater motor ability, for example, having much superior ability in skating.

Educationally, we acknowledge the factor of maturity by fixing the age for school entrance at about six. Teachers have recognized, however, the fact that children of the same C.A. have not reached the same degree of mental maturity. In some schools, recognition is made of mental maturity rather than C.A. by allowing younger special children to begin school if their M.A. is $6\frac{1}{2}$ or over. Some teachers also maintain that children should have reached a degree of mental maturity expressed by an M.A. of at least 6 before any attempt is made to teach them to read. Much time is wasted in trying to teach reading to pupils whose mental development has not reached a stage where they can learn readily. They do not possess reading readiness.

¹ When identical twins are used with one as a control twin and the other as an experimental twin, it is assumed that the twins are equal and alike. There is some variation even in identical twins; nevertheless, the experiment is interesting and probably valid.

Some experiments indicate that, if children are not taught systematically and formally until they are older than the usual age for beginning certain subjects, they will learn more rapidly and will eventually be ahead of those whose training in a given subject began earlier in their school experience and therefore extended over a longer period of time.

For example, it was found that, at the end of the second grade, children whose formal arithmetic was begun in the first grade were not ahead of pupils who had had none until the second grade. Thus, one group was taught formal arithmetic for 2 years, in both the first and the second grade, whereas the other group had formal arithmetic for only 1 year, which was in the second grade.

Tests given at the end of the second-grade work indicated that, in both the oral and the written tests, those who had begun formal arithmetic in the second grade were superior to those who had had it in the first and second grades. This experiment and others indicate that we must be wasting a tremendous amount of time in our schools teaching children subject matter that is too difficult for their level of maturity. If for the average and underaverage children we delayed the teaching of most of the present subjects a year or two, we should probably discover that in the end our graduates had learned more, acquired better habits of scholarship, and were in better mental health.

One of the evils of sending children who are too young to school is not that the school is not a good place for them to grow and develop in but that the present emphasis on subject matter places them under pressure to learn to read, to spell, and to acquire arithmetical facts before they are mentally or physically mature enough to do so. We have psychological evidence that many pupils are not mentally mature enough for the work that they are doing and that they would gain more if the school waited a year or more. It may be that the sensory development of the children—their eyes, their ears, the structures underlying their emotions, and their neurological development—is not adequate for the rigorous and formal tasks that many schools impose. A highly important factor in the learning and achievement of children, then, is maturity. The schools and home would consequently conserve their own efforts and that of the children by waiting until the latter are mentally, socially, and emotionally mature enough for the tasks imposed upon them and for the situations in which they are placed.

Adult Ages and Learning. There is no entirely satisfactory definition of adult age. It may be assumed here that the term applies to the age when maturity has been reached. For most practical purposes, any age

above twenty may be considered adult. After that age, a person does not become mentally more capable from merely growing older, as he does during the pre-teen age and also during part, if not all, of the teen age.

It is a common opinion that we learn with greatest facility during our childhood and youth. Good memory is usually associated with childhood and forgetfulness with adulthood. Common statements such as "You can't teach an old dog new tricks" convey the idea that adulthood is more or less impervious to learning. In the past, we have had little experimental evidence on the capacities and learning abilities of adults, and consequently there may be many faulty opinions. During the past 20 years, however, a number of such studies have been made, so that we now have actual evidence to interpret.

In general, the studies are of two types. One type of investigation consists in giving general aptitude, or intelligence, tests to adults who cover a wide range of ages. If the adults throughout the age range are potentially equal in capacity or equally well selected, the trend of the scores with age will indicate the trend of mental abilities with age. The other type of investigation consists in testing the ability of adults of different ages to learn a foreign language; to memorize series of non-sense syllables, arithmetic combinations, and words; and to learn the content of the usual school lessons.

The results of different investigators are conflicting, although most indicate that there is some decline in both general mental ability and learning ability after the twenties. The high point in mental development, as measured by aptitude tests and learning experiments, seems to be reached in the twenties, or the third decade of life. The data of various studies indicate that the first half of that decade is slightly superior to the second half. The decline generally observed up to the age of fifty is steady though not very rapid; after that age, the decline increases. Some results indicate that certain abilities, particularly vocabulary and general information, increase with age, whereas others, such as memorizing spoken directions, translating sentences according to a code, and seeing the relationship of different geometrical forms, decline with age. There is some indication that mental abilities not practiced decline with age, whereas those which are practiced do not decline but may even improve.

Specifically, we may inquire about the ability of adults to learn new materials in the same sense that children learn their lessons. Can adults learn readily, or do the years following the age of mental maturity impose a penalty on the powers of adults to learn? On the basis of all findings, it may be concluded that adults in their twenties

and thirties can learn much more effectively than elementary-school pupils and more effectively than even high-school pupils. Some decline in learning ability has been observed for people in their thirties and older, but conceivably this decline is caused not by actual loss of learning capacity but by rustiness, or lack of practice.

The studies of adult abilities suggest that there is no need for hurry about introducing young six-, seven-, and eight-year-olds to formal education. Even if any essential curricular materials are omitted, they can be readily and more profitably learned during the adult years. If we would recognize the capacities of adults to learn and the greater vitality of learning by adults, we should adjust our teaching material more adequately to the maturity level of pupils rather than crowding everything into the elementary- and secondary-school curriculum, whether it fits or not.

The record of human intellectual achievement suggests that mental powers are at their height during the years from twenty-five to forty or perhaps from twenty-five to fifty. It is during these years that mathematicians, chemists, physicists, inventors, writers, and artists are most creative. This statement does not imply that great achievements are not made after the age of forty or fifty, for individuals who have made important contributions to knowledge in their twenties and thirties continue to be creative afterward, also. Nevertheless, for the most part, men are not so productive after forty or fifty as before. They seem to have passed their intellectual prime and to have lost some of their former energy. Similarly, from the formal studies that have been made of intellectual achievement, the intellect seems to be at its best during the twenties, the thirties, and probably the forties. Mental-test results and also the results of learning experiments indicate some decline during these years. It is educationally sound to conclude, however, that during the years of adult life, and especially during the third, fourth, and fifth decades of life, learning powers are higher than during the usual school years.

SUMMARY AND REVIEW

The course of learning as depicted by learning curves may cover growth and learning over a period of several years and even all of life, or it may cover a short period of learning the combinations in arithmetic or throwing baskets in basketball.

There are daily fluctuations in learning and achievement caused by external and internal factors, which are influences outside and inside the individual.

Learning curves vary in their shape, corresponding to differences in the course of learning, but there are typical curves. A slow initial start followed by rapid progress is depicted by a concave curve, while a rapid start followed by less progress is represented by a convex curve. Some curves are concave-convex, and some are convex-concave.

A plateau is that section of a curve which is flat and represents a period of no progress. Plateaus are caused, it is believed, by a lack of motivation and loss of interest, by boredom, by fatigue, or by a reorganization of responses into a higher or more complex pattern. Any one of these factors or a combination of two or more may cause a plateau.

When a person is on a plateau, or in a period of no improvement, he should change his methods, work doubly hard, "just keep at it," or probably best of all take some time off.

Each person has his limits of improvement. The utmost limit is the theoretical, or physiological, limit. The limit that a person reaches by ordinary, or usual, effort is the practical limit. The optimum limit is a limit under the physiological limit and is reached by consistent, efficient effort.

During the period of growth, which is the years from birth up to about twenty, learning abilities increase. The curve representing learning in many instances follows the general growth curve. Age and maturity are important factors in learning, as is shown by experiments that demonstrated that a twin when older learned more with less practice than did the other twin when younger with more practice.

The course of learning ability throughout the adult years varies. Vocabulary and the fund of general information tend to increase, while ability to master new materials tends to decrease. However, adult ages, except probably the very advanced, are very effective for learning.

Test Your Thinking

- 1.** Why do children of elementary- and high-school age show more growth in learning in general than do adults?
- 2.** Suppose that a group of adults took up the study of economics and that the material they studied was almost entirely new to them. What would be their learning, or progress, curve? Suppose that they took up the study of the completely unfamiliar Japanese language. What would be their progress then?
- 3.** Suppose a group of twelve-year-old children took up the same subjects mentioned in the preceding question. Compare the progress of children and adults.
- 4.** We vary from day to day in our performance and are more effective some days than others. What causes variations in performance and learning?

5. What are some of the causes and symptoms of a plateau? What can be done to get off a plateau or to prevent them?
6. Describe the different limits of learning, and discuss the advantages or disadvantages of each.
7. Adults do not differ in their learning ability, for they have reached their limits of mental growth. Comment on the truth or falsity of this statement.
8. It seems that the growth and development during childhood that accompany growing older result in increased capacity to learn more quickly. Discuss the idea of maturation and learning ability.
9. The adult years are very good for learning, it can be contended, for during adulthood, especially the years from twenty to forty and possibly fifty, a person has his maximum capacity and also can profit from the years of previous learning and experience. Comment on these ideas.
10. If an adult wished to keep growing, he should take up the study of new areas or fields occasionally. Comment.

References

- BUSWELL, G. T.: Types of Learning and General Conditions Affecting Learning, *Review of Educational Research*, **9**: 274-284, 1939.
- COURTIS, S. A.: Maturation as a Factor in Diagnosis, Educational Diagnosis, *Thirty-fourth Yearbook of the National Society for the Study of Education*, Chap. X, pp. 169-187, 1935.
- GESELL, ARNOLD, and HELEN THOMPSON: Learning and Growth in Identical Infant Twins: An Experimental Study by the Method of Co-twin Control, *Genetic Psychology Monographs*, VI (No. 1), pp. 1-124, 1929.
- GUTHRIE, E. R.: The Psychology of Learning, Harper & Brothers, New York, 1935.
- HILDRETH, GERTRUDE: The Difficulty Reduction Tendency in Perception and Problem Solving, *Journal of Educational Psychology*, **32**: 305-313, 1941.
- LEHMAN, HARVEY C.: The Creative Years: "Best Books," *Scientific Monthly*, **45**: 65-75, 1936.
- LEHMAN, HARVEY C.: The Creative Years in Science and Literature, *Scientific Monthly*, **43**: 151-162, 1936.
- MCGEOCH, J. A.: *The Psychology of Human Learning*, Longmans, Green & Co., Inc., New York, 1942.
- MCGRAW, MYRTLE B.: Growth; *A Study of Johnny and Jimmy*, D. Appleton-Century Company, Inc., New York, 1935.
- MCGRAW, MYRTLE B.: Later Development of Children Specifically Trained during Infancy; *Johnny and Jimmy at School Age*, *Child Development*, **10**: 1-19, 1939.
- MUNN, N. L.: *Psychological Development; An Introduction to Genetic Psychology*, Houghton Mifflin Company, Boston, 1938.
- RUCH, FLOYD L.: The Differentiative Effects of Age on Human Learning, *Journal of General Psychology*, **11**: 261-286, 1934.

- RYANS, D. G.: Research in Learning, *Journal of Educational Research*, **36**: 335-342, 1943.
- SORENSEN, HERBERT: *Adult Abilities*, University of Minnesota Press, Minneapolis, 1938.
- SORENSEN, HERBERT: *Adult Abilities in Extension Classes*, University of Minnesota Press, Minneapolis, 1933.
- STRAND, J. B.: Experiments upon Learning in School Situations, *Psychological Bulletin*, **37**: 77-807, 1940.
- STRAYER, LOIS CURRY: Language and Growth: The Relative Efficiency of Early and Deferred Vocabulary Training, Studied by the Method of Co-twin Control, *Genetic Psychology Monographs*, VIII (No. 3), pp. 209-319, September, 1930.
- Yearbook of the National Society for the Study of Education*, **41**: (Parts 1 and 2), 1942.

CHAPTER XIV

PRINCIPLES OF LEARNING

What to Look For. Acquire the idea that the learning processes are not simple, and do not follow too precisely any principles of learning.

Observe that learning according to repetition, exercise, or use and disuse depends also on interest and attention.

Learn the meaning of readiness, or mental-set, and how it can be developed.

Note that the principle of effect pertains to results and answers and their reactive effects on learning. What are the relationships between the learning of the pleasant, unpleasant, and neutral and efficiency in learning?

What is the general meaning of the Gestalt principles as applied to learning? How can they be applied to teaching and learning situations?

Learn Dunlap's three hypotheses of learning. Study particularly the features of the method of learning through negative practice.

How do we learn by means of the associated, or conditioned, response? Be able to give some examples.

Learn the meaning of primary, associate, and concomitant learning, and be able to illustrate.

Logical and psychological learning are discussed, and their meaning should be comprehended.

Introduction. "Don't let the children hear what is incorrect, even in warning them against it," said the speaker at an institute held for teachers. "If the child hears the wrong forms, he will be as likely to learn them as he will the right ones."

Thus, teachers should not say to pupils, "It is wrong to say 'You and me are invited to the party.'" Only the right form, "You and I are invited to the party," should be presented. When only the correct is presented, there will be no confusion between the right and wrong forms.

Probably learning is not so simple as that. Perhaps there are factors such as motive and mental-set that invalidate the ideas expressed above. The following pages contain information related to this point and several others.

The Complexity of Learning. It is easy enough to recite glibly

various principles and theories of learning, but learning itself is not simple. The processes of learning are usually very complicated. They are complex because of the many characteristics of the learner as well as of the material learned. For example, there is evidence that learning a lesson as a whole or learning larger units is more effective than dividing the whole into a number of parts and learning piece by piece. This refers to the whole versus part method, which is discussed in the chapter "Being an Effective Student." However, there is no definite rule. Sometimes the whole method, sometimes the part method, or sometimes a combination of whole and part is best, depending on the capacity of the learner, the difficulty of the material learned, and the amount to be learned.

We know that it is impossible to learn anything—words, throwing a curve, multiplication tables, or what not—without trying, or without repetition and use, and yet repetition and use alone are not enough. We have learned that that which is repeated is learned. Yet there is a theory of learning, and it is supported with proof, that if one wants to get rid of troublesome errors and habits, one should indulge in them, repeat them, in fact. This idea is contrary to what is generally believed, but certain factors of desire and motivation are involved that make this seemingly contradictory method understandable enough.

The principles of exercise, readiness, and effect do not work out with piston-in-cylinder preciseness, but on the whole they are useful concepts. We know, for example, that, if a person is to become a good piano player, he must have a want, or readiness, to become one and must practice almost interminably, repeating various exercises many times. Then, too, the effects of his playing—the applause from the audience, the favorable reviews, and the financial returns—stimulate learning and achievement.

Regard the principles of learning as ideas and concepts of learning that are useful for learner and teacher. Keep in mind, too, that learning is very complex, involving many factors, and that there are situations where the learning processes may seem contradictory and illogical.

In terms of the methods of teaching that are used, it is hard to interpret effectiveness in terms of the principles and theories of learning. It would seem that the formal methods, with their frequent repetition in the form of systematic drills and reviews, would be more effective than the informal method, in which children learn their arithmetic, vocabulary, and other facts by taking them up as part of a project or to solve a problem. Yet apparently children learn more through this informal method, in which the facts and ideas are in a problem or

project setting. Just how learning takes place is often hard to explain; no single principle seems to apply. In the case of formal teaching versus informal, or its equivalent, the logical as against the psychological, it seems that learning psychologically in larger units according to interest and needs, as is true of the good project or activity method, is more effective.

In studying the principles and general concepts about learning, keep in mind that they are not rigid, unequivocal laws that apply in all situations. Think of learning as a complex process that may be better understood by making a broad and discerning application of its various principles.

The Principle of Exercise—Use and Disuse. This principle is one that we observe when we reread our lessons a number of times in order to learn them. Drill is also based on the principle that repetition fixes the facts to be learned. Children spend much time repeating arithmetic combinations, writing the words of spelling lessons a number of times, and defining and using words in order to establish their meaning. Students participating in a play learn their lines by reading them many times and repeating them when practicing. Repetition and use are so common that they are universally accepted as an effective means of learning. The child learns his piano lessons by playing them over and over; dance steps by repeating them many times; and the "piece," or poem, by saying it over and over until he can recite it without a mistake.

Lack of practice causes the memory of learned materials to weaken; and, in general, the longer the periods of disuse, the greater the loss. Human minds retain what they use. Words that we spell frequently are seldom misspelled, and we do not forget the meaning of words that are used in our writing and conversation. We learn and retain by use and forget through disuse. It is the exception to be able to repeat quotations, define the meaning of words, and recall names if they have been out of our consciousness for many years. Of course, some things have been learned so well that they are hardly ever forgotten even if not often used or recalled; but this is unusual.

Most of the "orations" that we gave on special occasions are forgotten. The "pieces" and "gems" that were memorized are in large part now gone from our memory. It is customary in some churches for children to memorize the catechism, parts of the Bible, and some hymns, but as adults few can recall what once was memorized. Should an adult reread material that he once learned by heart, he may even find part of it entirely unfamiliar to him.

Much that people learn is lost because it does not come within their experience again or because too long a time elapses before it recurs. Forgetting, apparently, is largely the result of disuse. Two points can be made in this connection. One is that we should devote much of our learning time and effort to acquiring those facts, skills, and abilities which we will retain because we use them. Second, we must recognize the fact that we shall learn much which by its very nature is a temporary acquisition and which will be lost when it has served its purpose. These two approaches seem inconsistent, but both are applicable to the school situation. The first principle should be used for determining what in the content of the school curriculum should be emphasized for permanent acquisition; the second, for determining what should be taught because of its immediate and temporary usefulness. One's experience in learning orations and "pieces" is an example. It was never intended that all the lines should be permanently retained or that subsequent experiences should recall their content. But, in a broader sense, the learner may have acquired from the experience an appreciation of what good or poor oratory is and may have developed certain attitudes that govern his attendance at public gatherings. In many instances, certain attitudes and feelings may be acquired that long outlast the memory of the material.

The psychology of use and disuse, which are the two phases of the principle of exercise, runs parallel to learning and forgetting. Through use, or exercise, we learn and retain; through disuse or lack of practice, the acquired is forgotten, and what is not learned remains unlearned. There are some qualifications to the principle of learning through practice. Learning is not directly proportional to the amount of exercise, or practice. In some instances, as in practicing music or memorizing poetry, less practice with more interest results in more learning than perfunctory practice over longer periods of time. Furthermore, in most instances, what is learned is soon forgotten, whereas other materials and experiences are retained much longer, and some seem never to be forgotten and come to mind often. Other factors, especially the emotional ones, influence learning so that the law of exercise cannot be applied quantitatively or mechanically.

Repetition alone is not enough to guarantee efficient learning, although it is important. Interest and purpose coupled with repetition make repetition much more effective.

Practical application of this point is to be found in present-day spelling and arithmetic drills, which are much shorter than formerly. Five- and ten-minute drills are adequate. We know that it is a waste

of time to drill and repeat the spelling of words, arithmetic combinations, and geography facts over long class periods, for interest thus wanes and time is lost.

In fact, it has been found in teaching the spelling of words and basic arithmetic facts that little drill is needed if the pupil meets these facts in several situations. For example, the ability in spelling is increased by experience with words. Children see words in their reading. If they use them in sentences and in compositions, and if the teacher and children find where the spelling words are used in various books, very little repetition is needed and thus not only are more words spelled correctly but also more are understood. The same is true of facts in arithmetic, history, and geography. If these facts are learned in a meaningful setting rather than just repeated over and over again or learned by rote, they are likely to be learned and remembered better.

Repetition alone is not enough. There must be interest, motive, and meaningfulness, too. Then exercise increases greatly the acquisition of facts and ideas.

The Principle of Readiness. In general, the principle of readiness may be described by saying that, when a person feels ready to act or to learn, he acts or learns more effectively and with greater satisfaction than when not ready. If a person feels ready to act and is prevented from doing so, he feels annoyed. A synonymous term for readiness is *mental-set*. A pupil has a mental-set to do his lessons when he is disposed to work at them. Other stimuli do not then distract him. He is interested in and therefore willing to concentrate on the tasks toward which his attention is directed. As he continues, his mind-set may weaken and the time is reached when continuing to act in a direction that earlier was satisfying becomes annoying.

If a student is directed to work on a lesson or to do a task when he has no readiness for it, he will not learn easily. If, however, the lesson proves to be interesting and captures his attention, his learning efficiency will improve and reach a high point. Much of the passive and unprofitable studying done by pupils is due to the fact that they have no mind-set for work but merely approach it in a routine and perfunctory way.

A readiness, or mind-set, to master a problem is equivalent to a desire to do so. One of the fundamental duties of a teacher is to develop in children a readiness to learn their lessons. A good assignment, for example, raises interesting questions and cleverly introduces new materials so that the pupils will be anxious to study them. A teacher who is specific in her assignments and asks interesting questions for the

students to solve arouses their curiosity and develops in them a favorable mind-set toward the assignment. On the other hand, the teacher who perfunctorily takes up one lesson after the other in mechanical order fails to develop the pupils' readiness for their lessons, and they passively approach their assignments as a mere matter of routine.

The mental readiness, -set, or interest of pupils is aroused and maintained on a broader scale by using the problem and project methods. Instead of formally taking up a topic, the teacher aims to bring about a learning situation in which the topics will be covered in order to complete a project or solve a problem. If the pupils have a motive and a purpose, they sustain a mind-set for their work, a condition that is equivalent to maintaining interest in it. For example, in learning to write letters the pupils actually write real letters to real people rather than form letters to hand to the teacher. In some schools the children exchange letters with boys and girls in other countries. Under such circumstances, children have a mental-set for writing correctly and interestingly. Letter-writing assignments may also be connected with pupils' hobbies. If, for instance, the children are maintaining a flower bed and feel the need of specific information, they will write more willingly for bulletins and reports from the agricultural bureaus than if they formally prepared letters according to the teacher's assignments.

Similarly, in the history class, there is unlikely to be much psychological readiness among students if they are asked to "study the next six pages." If, however, the teacher takes the students to points of historical significance in the vicinity and correlates the lessons with the historical excursion, they are more likely to develop an active readiness to study. Some teachers overlook opportunities to prepare their pupils psychologically for their lessons. In studying Lewis and Clark's explorations the pupils and the teacher in a certain city mechanically discussed the contents of the book, even though they were only a few city blocks away from part of the marked route that they had taken when they passed through the great Northwest. The teacher could have taken the pupils to some of the local points of the route, traced with them the route through their immediate territory, and expanded their study from that point on. Vivid interest is developed by making the problems real and concrete rather than by confining them to the abstract elements of a textbook. When interest in a topic has been generated, the student will work on it with more satisfaction and will learn more.

Sometimes events and situations occur that develop a readiness, or mind-set, that takes the pupil's attention away from his lessons.

If the teacher is wise, she can in some instances utilize the situations that seem to be distracting. For example, a few years ago an eclipse of the sun occurred on a fall afternoon when school was in session. In a particular school (and possibly in thousands of others) a teacher had difficulty in teaching because the children were distracted by the approach of the eclipse although they could not go outside and see it. She would not deviate from her daily program of study to give them that opportunity. At the end of the school day she complained that she had found it so hard to keep the children's attention on their work that she was nearly exhausted.

Because of the curiosity that the children had for the eclipse of the sun, their minds were set, not for their lessons, but for the natural phenomenon that was occurring. The teacher should have taken her pupils outside to view the eclipse and discuss it with them. She had a rich opportunity to utilize the mind-set of her pupils to teach them various facts and principles of geography. To a teacher with originality the experience could also have been the basis for language lessons. Instead she worked against her pupils' natural interest, irritated them, exhausted herself, and lost a fine opportunity to teach effectively.

The Principle of Effect. In general, the law of effect is that learning accompanied by a pleasant or satisfying feeling is strengthened but that learning associated with an unpleasant or unsatisfying feeling is weakened. This principle pertains to the feeling, or emotional state, following the learning experience. When a child finds the correct solution to a question, he feels pleased about his achievement and the connections between the stimulus and response are consequently strengthened. If the solution is incorrect, the associated feelings of annoyance tend to rub out the connections that have been made, unless, of course, the experience is so painful or embarrassing that the event and the mistake are fixed in the memory. For the most part, however, the connections for the correct responses tend to persist, and those for the incorrect are weakened and eliminated; a feeling of satisfaction fixes a response, whereas a feeling of annoyance tends to destroy it.

Besides the influence that the affective, or feeling, state has on the immediate response, it also controls, to a considerable extent, the interest with which the learner attacks a problem. Pupils avoid problems which have caused them annoyance and approach with interest those the study of which has resulted in a feeling of satisfaction.

Success and failure condition the learner to a large degree. Success with a task is generally accompanied by feelings that affect the learning process favorably, but failure is accompanied by the opposite emotional

state. The principle of exercise is also involved, for success implies that the proper response has been made and that a repetition of the same or a related response is more likely to occur. On the other hand, failure means that a response has not been made at all or that the inaccurate response that was made will not be likely to persist because of the feeling of dissatisfaction that accompanied it.

The laws of readiness, exercise, and effect are not separate and independent of each other but are mutually interrelated. Readiness and emotional effects influence practice; in turn, the emotional effect of practice determines a pupil's readiness in another situation. The pupil who has been unsuccessful is reluctant to resume his lessons, but he who has been successful has a favorable mental-set toward his work.

Success and failure influence learning and behavior greatly and are related to the capacity of the learner. It is the most capable who have most successes and the least capable who have most failures. Consequently, success stimulates those who are already most capable of learning, and failure further retards those who are least able. Thus, it is desirable to enable everyone to experience success, and it should be possible through careful educational guidance to adjust the pupils and their work so that they will experience an optimum amount of success.

The relation of success and failure to mental health has been discussed at some length in an earlier chapter. That discussion emphasized the relation of success and failure to the emotional life of the child. The emotions and mental health are very important in themselves, but the emotions incident to success and failure in learning are especially significant. The feeling tone is an important element in readiness, exercise, and effect. A pupil is in a state of readiness to learn when his interest is keyed and his feeling tone is set for the problem. Exercise, or practice, is most effective when interest in the problem is at a high pitch. Learning is most extensive when the emotions accompanying the completion of a task are satisfying. The emotional, or feeling, element in the learning situation governs the student to a considerable extent, for the intensity of his effort is a function of his interest or feeling. The whole problem of learning is not so simple as this; there are many qualifications, but the principles given are so important that they should be observed.

The emotions of a learner influence his efficiency. We describe the principle of effect in terms of feeling, and there is considerable evidence indicating the influence on learning of praise, blame, reward, punishment, and other factors.

To test one phase of the emotional element in learning, experiments have been conducted to discover the ability of persons to learn words of different emotional tone. For instance, Carter investigated the ability of sixth- and seventh-grade children to learn to associate pleasant, unpleasant, and neutral, or indifferent, words with pictures. Pictures were presented one at a time, and a given word was associated with each. The purpose of the experiment was to test the ability of the pupils to recall the associated words with the successive presentation of the pictures. There were five trials, and failure to respond and incorrect responses were observed.

Pleasant words are such words as *mother*, *candy*, and *marry*; unpleasant, such words as *fright*, *stink*, and *kill*; and indifferent, or neutral, such words as *pen*, *trade*, and *number*. Three series of eight words of each type—pleasant, unpleasant, and indifferent—were used in the manner described—a word given along with a picture in successive trials, the object being to recall the word associated with a specific picture.

In Table 9 are given the results. The second column shows the rating of the pleasantness of the words on the basis of the children's classification of them into five groups according to degree of pleasantness and unpleasantness. If all the pleasant words had been called most pleasant and placed in group 1, then the average for the pleasant words would have been 1.00; similarly, if the unpleasant words had been classified in group 5 by all the children, the average rating for those words would have been 5. But there was some disagreement, so that the averages were not completely at the extremes 1 and 5 for the pleasant and unpleasant words, respectively. The neutral, or indifferent, words fell in between the extremes.

The third column should be explained, for it indicates the time taken to respond with words to the words of the experiment when they are given. The method used in testing association time is essentially this: The experimenter tells the subject to respond with the first word that comes to mind when a word is pronounced. In this instance the words pronounced were the words used in the experiment and classified as pleasant, indifferent, and unpleasant. The averages show a slight tendency to respond more quickly to pleasant than to unpleasant words. This is consistent with findings showing that the emotional character of the words, because of the nature of the experience of the subject, affects his reaction time.

The evidence of Carter's study suggests that pleasant words are learned more easily than either unpleasant or indifferent ones. But

the unpleasant words were learned with fewer errors than were the indifferent. To generalize findings of this kind may lead to oversimplified conclusions. However, it may be said that the feeling element in learning influences learning. We seem to learn most poorly that which has no emotional tone. Of that which evokes a feeling, we learn the pleasant better than we do the unpleasant.

TABLE 9. FREQUENCY OF ERRORS IN THE LEARNING OF PLEASANT, UNPLEASANT, AND INDIFFERENT WORDS*

(1)	Mean P - U rating	Mean associ- ation time	Used in place of cor- rect word	Re- placed by in- correct word	Failure to re- spond	Sum of all errors
(2)	(3)	(4)	(5)	(6)	(7)	
"Pleasant" words:						
Series I, 8 words.....	1.66	4.50	353	298	668	966
Series II, 8 words.....	1.86	3.49	167	144	516	660
Series III, 8 words....	1.72	3.28	100	119	455	574
Average, or totals†.	1.75	3.76	620	561	1,639	2,200
"Indifferent" words:						
Series I, 8 words.....	2.72	4.52	209	432	1,044	1,476
Series II, 8 words.....	2.50	3.46	113	187	631	818
Series III, 8 words....	3.01	3.61	89	187	625	812
Average, or totals..	2.74	3.86	411	806	2,300	3,106
"Unpleasant" words:						
Series I, 8 words.....	4.34	5.16	315	339	886	1,225
Series II, 8 words.....	4.29	4.03	130	179	653	832
Series III, 8 words....	4.19	3.62	124	147	520	667
Average, or totals..	4.27	4.27	569	665	2,059	2,724
Grand total.....	....	....	1,600	2,032	5,998	8,030

* CARTER, HAROLD D., *Journal of Educational Psychology*, 27: 59.

† The values in columns (2) and (3) are means; those in columns (4), (5), (6), and (7) are sums. The entries in column (7) are the sums of the corresponding entries in columns (5) and (6).

Thus, it is important that subject matter be vitalized and made interesting. A teacher, in turn, who is neutral and indifferent will probably not be so effective as one who is dynamic and teaches with conviction. To promote learning, feeling and emotion should be injected into both the teaching and the learning process. Again we have evidence pointing to the importance of the character and personality of the teacher.

O'Kelly and Stickle tested the retention of pleasant and unpleasant experiences by causing college students on their return from their

Christmas vacations to report pleasant and unpleasant experiences that they had had during their vacations. Sixty-two per cent of the experiences were pleasant, and 37 per cent were unpleasant, which is almost a proportion of 2 to 1. Ten weeks later, 48 per cent of the pleasant experiences were recalled and 40 per cent of the unpleasant, indicating that there is better retention of the pleasant than the unpleasant. The importance of this differential retention is greater than the differences in the percentages of 48 and 40 indicate, for there were nearly twice as many pleasant experiences first reported.

When analysis was made of the individual memory of pleasant and unpleasant experience, it was discovered that 63 per cent remembered a greater proportion of pleasant memories, 31 per cent a greater proportion of unpleasant, and 6 per cent an equal proportion of each. This difference in the individual has given some basis for the suggestion that there are the optimists who remember the pleasant and the pessimists who remember the unpleasant; this is merely a suggestion, however. It is generally accepted that we have a better memory for the pleasant, and conceivably there may be a tendency to repress the unpleasant.

The Gestalt Principle of Learning. According to the Gestalt school of psychology, other psychologists have overemphasized the individual elements in the learning situation and have stressed too much the *S-R*, or stimulus-response, theory, also referred to as the *bond theory*. The idea according to the bond theory is that there is a neural bond in the organism between the stimulus and the response. It is wrong according to the Gestaltists to think of learning and memory as being determined by the number of bonds, or connections, between individual stimuli and responses.

Instead, learning is determined by the pattern, or configuration, of the stimuli. The interrelationship of the elements, how they shape up as a whole, is what causes the character of the perceptual field. The perceptual field will be shifted or changed according to the arrangement or new patterns of the stimuli. The changes in pattern result in new learning. Consequently, there can be a change in the field, or pattern, of stimuli that results in sensing the idea or acquiring the solution quick as a flash. This is called *insight*. A learner may, for example, be working a problem in arithmetic or a puzzle and make no progress until the solution comes all at once, so to speak. According to the Gestaltists, this is learning by insight.

That it is not the absolute individual stimulus but the interrelationship of stimuli, or integrated pattern, was illustrated in an experiment

with chickens trained to peck food from a paper a darker shade of gray than the paper next to it. Then the papers were changed. The paper that had been the darker became the lighter, for a new paper of a still darker shade was present. The chickens then pecked from the darker paper instead of from that from which they had pecked before. The relative feature of the situation—that of being darker—was what determined the response, and not the absolute stimulus.

The Gestaltists, in their theories of learning and experimentation, emphasize meaning, organization, integration, and pattern of stimuli. The whole of the situation, rather than its separate parts, determines the perceptions of the learner. Gestalt psychologists have caused psychologists and educators to conceive of the problem of learning in more comprehensive terms and units.

In a general way, Gestalt psychology can be applied to teaching and education by organizing subject matter and activities into larger units. In fact, education is getting away from the bit-by-bit, piece-by-piece, method, substituting large, meaningful wholes instead, and thus in effect Gestalt principles are being practiced to a considerable extent.

Thus in physical education, when teaching golf, swimming, tennis, or any sport, the teacher should try from the first to give the students the general pattern of the activity. For example, in the case of golf, instead of beginning with lessons on stance, lessons on swinging the driver, special lessons on approaching the green, and lessons on putting—instead, that is, of teaching more or less isolated parts of the game—the teacher should give the students from the start a good general picture of the game as a whole and should let them play the whole game. He should give the specific practice as needed but should first see that the students understand the general pattern of the game, the game as a whole.

Similarly, in geography, algebra, geometry, history, literature, and most other subjects the teacher should try to orientate the students to the general organization, or pattern, of the subject being studied. Then they can see the interrelationship of the parts and can understand more fully what they mean.

Possibly one of the principal reasons why the activity, project, and problem methods seem to be so effective lies in the fact that Gestalt principles are probably functioning. In the activity method, large and not too clearly defined units are covered, and in many instances the material is covered as a result of exploration. In the activity or project method, a student studies according to his needs and interests and

consequently goes wherever he must go to find logically related material. Thus, being guided by need, curiosity, and interest, a student will cover larger areas of learning and is more likely to see the interrelationships of related materials and organize them into a pattern.

REPETITION AND LEARNING

Ordinarily, it is held that in a general way the extent of learning is in proportion to frequency of repetitions. Consistent with the principle of repetition is the statement that no exception should be allowed to occur. According to some pedagogues, for example, only "It is I," should be repeated and not the more usual expression. It is argued that the wrong forms should not be repeated, even for purposes of correction. This point of view is not entirely sound, for repetition alone does not fix a response. A contrary theory holds that the best way to eliminate errors is to repeat them. According to this theory, the way to eliminate a grammatical error is to repeat it consciously; the way to learn to spell a word correctly is to repeat the incorrect spelling; and the way to prevent common slips in typing is to type the incorrect word.

In a discussion of learning, Dunlap presents three theories. One of them has been discussed without being formally stated, but all three will be given together here to give us a clearer perspective of the effects that the occurrence of a response may have on the likelihood of its occurring again. Dunlap uses the names of the Greek letters alpha, beta, and gamma to designate his three hypotheses. They are as follows¹:

1. Alpha hypothesis. The occurrence of a response increases the probability that it will occur again when there is the same stimulus.
2. Beta hypothesis. The occurrence of a response lessens the probability that the stimulus that produced the response will again produce it.
3. Gamma hypothesis. The occurrence of a response has no effect on the probability of the occurrence of the response.

The alpha hypothesis is the more conventional one and is generally considered as explaining learning by repetition. The beta and gamma hypotheses, however, indicate that an experience or response either diminishes the likelihood of the response's occurring again or has no effect at all. According to these theories, there are three effects of a stimulus and response situation—the positive, the negative, and the neutral. On the basis of these, a wider point of view is taken toward the effects of repetition and practice. In them we can see the explana-

¹ DUNLAP, KNIGHT, *Habits—Their Making and Unmaking*, p. 78, Liveright Publishing Corp., New York, 1932.

tion for the responses of children, some of which seem to contradict our more conventional principles of practice.

The Beta Theory. Because this theory has been defined, the following discussion of it will be devoted to its application. Dunlap reports several experiments that he conducted according to this theory. They included attempts to cure stammering, fingernail biting, thumb sucking, and several other habits. In general, the procedure consisted in practicing or repeating the wrong habit. This is called *negative practice*.

There are certain attitudes that the learner should have in order that the negative practice may be effective. He must be aware of the bad effects of the habit, understand the advantages of breaking it, have a desire to break it, and engage in practicing it with the earnest purpose of breaking it. The points of view and general attitude of the learner must be as indicated, or the procedure will not be effective.

Illustration may be given of the theory as it was applied to stammerers. During the practice periods, they stammered voluntarily, simulating as nearly as possible their involuntary stammering. Occasionally, a stammerer would attempt to speak words without stammering. If he could do so successfully, he would discontinue the negative practice. If he was unsuccessful, he would resume immediately the negative practice, or voluntary stammering. Attempts were made later again to speak without stammering; if successful, the negative practice was abandoned.

Dunlap reports that after 3 months some adolescents were completely cured. He also reports good results in breaking the habits of fingernail biting and thumb sucking. His results are encouraging enough to warrant teachers' experimenting with the method. No one, however, should proceed without carefully planning the procedure and being grounded in the psychology involved.

A teacher, for example, might experiment with children who have trouble with their *th*'s. In some areas, there are many children with foreign-born parents who pronounce their *th*'s as *d*'s or *t*'s, in such words as *rather*, *though*, *those*, and *moth*. A group of such children might be organized for periodic negative practice. In trying this method, it is necessary for the teacher to give the children confidence that they can break their habit of pronouncing the *th*'s incorrectly and to tell them that they should not practice listlessly but concentrate on the negative practice. An ingenious teacher can find many specific situations in arithmetic, reading, language, and other school subjects as well as in the field of habits and other personality problems where he might profitably try negative practice.

LEARNING THROUGH THE ASSOCIATED RESPONSE

Much that we learn is learned through connection with certain facts and situations. Many of our feelings and attitudes are acquired through associations. A given color may be favored because our experiences with that color have been pleasant. Thus, a young woman may like blue because her party dresses and traveling suits have been blue and therefore are associated with a festive mood. Black may not be so popular because it is associated with old age and funerals. An individual may have learned to regard people with certain facial features with suspicion because somebody with similar features once tricked him. Words are learned by associating them with the thing that they describe or name. In situations involving facts and attitudes, we acquire them through association.

The associated response can be illustrated with the following diagram:

$$\begin{aligned} S_1 &\rightarrow R_1 \\ S_2 &\rightarrow R_2 \\ S_1 + S_2 &\rightarrow R_2 \\ S_1 &\rightarrow R_2 \end{aligned}$$

S_1 represents stimulus 1, and R_1 represents response 1. S_2 represents stimulus 2, and R_2 represents response 2. According to this outline, S_1 brings out R_1 ; S_2 evokes R_2 ; and, because S_1 and S_2 occur together, S_1 causes R_2 .

We may illustrate by showing how a child was conditioned to fear a harmless snake. The presence of the snake evoked a manipulative response on the part of the child, who played with it. The mother saw the child with the snake and screamed frightfully. The baby was thereby conditioned to fear the snake.

The following arrangement illustrates how the child learned to fear snakes:

S_1 (sight of the snake by the child).....	R_1 (playing with it)
S_2 (sight of the snake by the mother).....	R_2 (screams because of fear)
S_1 (child sees snake).....	R_2 (fear of snake)

In this instance, the mother screamed in the presence of the child and the snake, and the child was conditioned then to fear the snake because fear was attached to or associated with the snake. Therefore, when the child sees a snake S_1 , he will respond with fear, or R_2 .

The teacher as an important factor conditions the attitude of her

pupils toward the subjects and situations that arise in the classroom. If the teacher has a strong personality and therefore is appreciated by her pupils, she will, by the principle of associated response, condition them to be interested in their schoolwork. She has their good will, and consequently she is associated favorably with their responses in the situations in which she is a factor. The presence of the teacher evokes a favorable response, and therefore the schoolwork for which she is responsible will evoke a more favorable response, also. Conversely, if the pupils are antagonistic in their attitude toward their teacher, they are also likely to be conditioned to take the same attitude toward most situations in her classroom. The importance of the teacher in this connection can hardly be overestimated.

PRIMARY, ASSOCIATE, AND CONCOMITANT LEARNING

Educational philosophers and psychologists have pointed out that, while students are learning the basic facts which have been assigned them, there are related learnings of one kind or another that also take place. We have just referred to the attitude that students acquire toward their subject in terms of the way they feel toward their teacher. Furthermore, when students are studying to acquire certain facts, these facts may lead to others.

These learnings are referred to as *primary*, *associate*, and *concomitant* learning. In this instance, the assignment to be learned is the primary, the attitude developed toward the subject is the concomitant, and the associate consists in facts learned because they occur in connection with the primary learning. The primary learning consists of the facts, principles, theories, etc., that are the main core of the lessons in particular and the curriculum in general. The associated learning consists of the facts and other more objective materials that are learned because they are related to the primary and are logically brought into the lesson. The concomitants consist of the attitudes, ideals, and appreciations that the student acquires because of his school experience.

Primary Learning. Let us assume that the lessons being studied are the geography of the northeast section of the United States. The primary learning will consist of knowledge of the climate, topography, industries, and so forth, of this section. The basic and traditional facts constitute the primary learning.

Associate Learning. While studying the geography of the New England states, the students become interested in the history of the section. They relate its historical development to its geographical characteristics. They also become interested in the industrial develop-

ment of this section as well as its present-day problems. Some students become especially interested in learning why so much of the textile industry has moved from New England to the South.

Many related historical, economic, and geographical facts will be learned. Such related facts are called associated learning.

Concomitant Learning. In studying the New England states, certain attitudes and points of view are sure to develop. Certainly the students will appreciate the courage and enterprise of a people who could accomplish so much as the New Englanders in a region which was none too fertile and promising but in which they made the most of their environment and built up a great industrial and cultural region. The New Englanders displayed courage, industry, and thrift, which the students will probably appreciate. It is certain that the students from studying the New England states will develop certain ideals, attitudes, and appreciations which they did not have before. These are known as concomitant learning. Such learning may be either desirable or undesirable.

In a sense, the attitudes developed govern behavior more than do facts and information. The way in which a person acts in a situation is largely controlled by his points of view. Feelings and attitudes develop out of knowledge and facts, it is true, but attitudes and feelings also determine how we interpret facts and knowledge.

The ideals, attitudes, and appreciations acquired in a situation govern behavior in many instances to a larger extent than do the facts, skills, and principles acquired. The concomitants are an outgrowth of facts and skills, but the former often long outlive the latter. We can illustrate by considering the effect that certain courses may have on the behavior of the students who took them. Let us assume that some citizens in a community who have taken courses in bacteriology and chemistry are faced with the problems of voting for or against a sewage system or other measures of sanitation. They most probably have forgotten most of their bacteriology and chemistry, but certain attitudes and appreciations engendered by the study of these subjects are almost certain to cause them to favor improved sanitation. Long after the facts in chemistry and bacteriology that are found in courses and examinations have been forgotten, certain attitudes and appreciations will remain to influence behavior.

Concomitants, or the intangibles acquired, are of such importance that psychologists and educators might well be concerned as much about their psychology as about the primary, or core, learning. In a country of free public education the attitudes and ideals that pupils acquire

are of much importance. We spend millions of dollars and the lives of thousands of teachers and other employees educating our children, youth, and adults. In particular, it matters whether those educated in our schools at public expense leave them with a selfish individualistic attitude and an ambition to exploit their fellow man or whether their attitude is a more cooperative one and expresses itself in social consciousness. Furthermore, the ideals, broad sympathies, and scientific attitudes that are learned contribute much to happy and fruitful living.

LOGICAL AND PSYCHOLOGICAL LEARNING

Logical learning refers to the learning of material when it is organized logically, as is the case when it is organized from simple to complex, or from the easier to the more difficult. United States history is taught logically when it is taught chronologically, beginning before Columbus and continuing up through the decades and centuries until the present day is reached. Arithmetic is taught logically when fractions and decimals are taken up so that a knowledge of fractions is preparatory to studying decimals. Logical learning is usually associated with formal and systematic teaching.

Psychological learning, on the other hand, does not pay much attention to logical, or systematic, organization of subject matter, although it is not necessarily inconsistent with it. In psychological learning, the student studies the material according to his needs or interests. If he is engaged in an activity or is working on a project, he studies anything that will give him the ideas and information that he needs to answer his problems.

When the psychological method is used, the teacher does not say, as she does when the logical method is used, "We don't take that up at this time." In the psychological method the pupils study any phase of any subject to which their interest and need take them. Of course, the material studied is usually consistent with the capacity of the student to study it profitably.

In the logical method the subject matter is taken up in a prescribed order. The course of study is carefully organized, and it is followed accordingly.

Experiments have proved that students can learn effectively when they study in order to learn the facts they need even though no systematic order is followed. Conceivably, purpose and interest make up for a step-by-step procedure. After all, in adult life when a person has a problem to solve, he goes after the facts as directly as possible and

learns all he can from whatever source is at his disposal in order to learn what he wants to know.

Logical and psychological learning are fundamental to educational and teaching theories and methods. Logical learning is characteristic of the old school with its more formal methods, while psychological is characteristic of the new child-centered school.

SUMMARY AND REVIEW

The processes of learning are not simple and do not follow any given principle and hypothesis of learning precisely.

According to the principle of exercise, learning tends to be in proportion to the amount of repetition, or use, and forgetting in proportion to the amount of disuse. Other factors are involved, such as interest and concentration.

The principle of readiness, or mental-set, states that a person learns more effectively when he wants to learn or is ready or motivated to do so. A teacher observes this principle when she interests the pupils in what they are going to do and keeps them interested.

When a response is accompanied by a feeling of satisfaction, that response is more likely to be learned than one accompanied by an unpleasant feeling. Thus success accelerates learning, and failure retards it. The pleasant is learned and remembered better than the unpleasant.

Gestalt psychology emphasizes the pattern of the stimuli. A shift in the pattern of the stimuli may cause the learner to see the answer. This is called insight. The teacher should apply the Gestalt idea by giving the students as comprehensive a pattern of the work at hand as possible.

Dunlap's hypotheses of learning, alpha, beta, and gamma, are to the effect, respectively, that the occurrence of a response increases, lessens, and has no influence on the probability of the recurrence of the response to the same stimuli.

Learning through the associated response is learning by association or conditioning. Pupils learn to like or dislike particular subjects or school in general because of the good or poor personality of the teacher.

Primary learning consists in mastery of the immediate objectives; associate learning consists in learning the related objectives; and concomitant learning consists in the feelings, motivation, and points of view that are outcomes of the primary and associate learnings.

Logical learning refers to learning in a logical order involving sequence, difficulty of material, and systematic organization. Psycho-

logical learning refers to learning in any order dictated by need and interest. Logical learning is a feature of the older, formal type of school, while psychological learning is characteristic of the new school.

Test Your Thinking

1. Even though we recognize that learning is very complex and that no single principle or law applies fully and unequivocally, we try to define learning in terms of principles. Comment.
2. It is true, of course, that we usually do not learn in direct proportion to the number of repetitions. But some practice or repetition is necessary if one is to learn; activity, repetition, and use are definitely conducive to learning; lack of repetition results in forgetting. Comment.
3. Readiness, or set, for a matter is equivalent to saying that the organism is ready to attend to that matter. Discuss.
4. Discuss whether or not a teacher's ability to arouse curiosity and interest is equivalent to saying that she develops readiness, or mind-set.
5. Show whether or not success and failure and the pleasant and unpleasant are the principal effects that influence learning and other behavior, too.
6. Explain how the Gestalt principle can be applied effectively by a teacher in her teaching.
7. How do Dunlap's three theories or principles of learning amplify our concepts of the traditional principle of repetition, which Dunlap gives as the alpha hypothesis?
8. Dunlap's beta hypothesis is the one that seems inconsistent with our traditional points of view. What are the forces and motives that must function if negative practice is to be effective?
9. Show how our attitudes and interests are developed toward things because of how they go together, or through associated response.
10. Give an example each of primary, associate, and concomitant learning.
11. The trend in modern elementary and secondary education is toward the more informal education with its activities, problems, and projects. How is logical and psychological learning involved in this trend?

References

- BODE, BOYD H.: *Conflicting Psychologies of Learning*, D. C. Heath & Company, Boston, 1929.
- CARTER, HAROLD D.: Emotional Correlates of Errors in Learning, *Journal of Educational Psychology*, 27: 55-67, 1936.
- COOK, T. W.: Repetition and Learning, Stimulus and Response, *Psychological Review*, 51: 25-36, 1944.
- DUNLAP, KNIGHT: *Habits; Their Making and Unmaking*, Liveright Publishing Corp., New York, 1932.
- GUTHRIE, E. R.: *The Psychology of Learning*, Harper & Brothers, New York, 1935.

- KOFFKA, KURT: *Gestalt Psychology*, Harcourt, Brace & Company, Inc., New York, 1935.
- KÖHLER, WOLFGANG: *Gestalt Psychology*, Liveright Publishing Corp., New York, 1947.
- MUNN, N. L.: The Psychology of Learning and its Classroom Application, *Peabody Journal of Education*, **19**: 257-265, 1942.
- PECHSTEIN, LOUIS A., and F. D. BROWN: An Experimental Analysis of the Alleged Criteria of Insight Learning, *Journal of Educational Psychology*, **30**: 38-52, 1939.
- THORNDIKE, E. L.: *The Fundamentals of Learning*, Columbia University Press, New York, 1932.
- THORNDIKE, E. L.: The Influence of Differences in the Amount of Practice in Causing Differences in Achievement, *Journal of General Psychology*, **31**: 101-109, 1944.
- WHEELER, R. H., and F. T. PERKINS: *Principles of Mental Development*, The Thomas Y. Crowell Company, New York, 1932.
- WHITE, M. M.: Some Factors Influencing Recall of Pleasant and Unpleasant Words, *American Journal of Psychology*, **48**: 134-139, 1936.
- WIEDEFELD, M. T.: An Experimental Study in Developing History Reading—Readiness and Fourth Grade Children, *Johns Hopkins University Studies in Education*, **31**, 1942.

CHAPTER XV

INTEREST, ATTENTION, INCENTIVES, AND MOTIVATION

What to Look For. Note that intensity of effort varies greatly, being very low when one is not interested and motivated but very high when one is highly motivated or is working for rewards and for a feeling of prestige and personal worth.

Teachers list how to interest pupils as their primary problem. Learn the various methods that are used to motivate and interest pupils.

Distinguish between passive and active attention, and note the degrees of attention that characterize the students in their classes. Learn what the teacher can do to stimulate the attention of the pupils.

What may be the bad effects of very strong competition? Do children accomplish more when they work for themselves or for the group? How does the use of prizes of various kinds affect achievement?

Under what situations is working in a group or working alone more effective?

Praise and reproof affect various pupils differently. Learn these differences.

What effect has knowledge of results or knowing the progress one is making on attention and achievement?

What effect have the developing and increasing of ability on interest?

Will pupils work harder when they know that they will pass at the end of the school year or when they are threatened with failure?

What are the qualities of good and poor incentives and motivation?

Learn what the effect of the use of audiovisual aids is on the achievement of pupils. Understand the pattern of the experiments on the effectiveness of audiovisual aids.

Introduction. A number of adolescent boys in a potato field were listlessly picking potatoes and putting them in their bushel baskets. They moved along together from one end of the field to the other. When they were within easy sight of the end, one boy shouted, "I'll finish my row first!" Immediately everyone abandoned his slow tempo and speeded up as fast as he could. All picked more than twice as fast as before, each trying to reach the goal first. The winner gained a feeling of great satisfaction and of personal worth.

Of major concern not only to educators and psychologists but to people in general are the conditions and factors that cause maximum

achievement. Some conditions of work cause greater achievement than others. Under some conditions, a child or adult is greatly interested and works with zeal, and his attention is active. In another situation, his attention is passive, and he works listlessly.

Under one teacher the pupils manifest great interest and attack their work with avidity. The same pupils with another teacher show little interest and behave as if they had no purpose in life. Similarly, when directed by a certain conductor, an orchestra or choir will seem highly motivated, but the same organization responds indifferently to other leaders.

Thus it is throughout many spheres of life—responses can be evoked with different intensities. Some persons are stimulated by praise and favorable recognition; others, by reproof and unfavorable criticism; still others respond to material rewards. Usually, we work hard to outstrip others, and many will put their utmost into an activity in order to obtain the distinction of winning a prize, receiving honorable mention, or being selected as a member of an honorary society.

Boys on the college football team expend every bit of energy that they possess in order to keep their place on the team, earn a letter, and win the praises of the audience and of the newspaper reporters of sports events. Hardly any professional athlete, no matter how big the prize he is working for, plays and works harder than the high-school and college athlete, who is spurred only by his desire to receive the recognition and approbation of his fellows. Even the professional athlete works as hard for distinction and to possess a top rating as he does for his salary.

Many factors cause young and old to work hard, and possibly several of them are associated with the drive or motive to obtain personal satisfaction through a feeling of prestige and worth. Praise serves this purpose; reproof or scolding causes a feeling of inferiority and may spur one to change his behavior to avoid another scolding. A prize may be valuable in itself, but it is still more coveted if it brings recognition to its owner. Some of the greatest incentives in history have consisted in medals or a small wreath of laurel.

In the schoolroom many techniques are used to spur pupils to greater achievement. They are praised; scolded; ignored; given prizes; placed on the honor roll; given special privileges; kept aware of their records and the progress that they are making; pitted against each other in individual and group rivalry; encouraged to work for a goal or with a purpose; and, in general, made to attach pleasure and satisfaction with accomplishment and dissatisfaction with failure.

The purpose of the methods and techniques used is to evoke maximum attention to one's work and thus produce maximum achievement. When teachers employ effective methods, the pupils have a set and readiness for their work, attacking it with purpose and motive and consequently with a determination to achieve. When teachers set up attractive incentives, pupils develop an initial drive for their objectives, which, in turn, is maintained by the knowledge, skills, and abilities being acquired. An important influence in developing a drive is the competence that the pupil feels he is acquiring.

The Teacher and Interest. When over 1,000 teachers were asked to list their teaching problems, the problem they listed most frequently was how could they interest the children in their work. They were most concerned about how to motivate their pupils and stimulate them to work hard.

A second problem that they emphasized, and one closely related to the problem of getting children interested, is how to present good materials so that their classes would be alert and lively. Teachers also want to know how to cause their students to study effectively.

All these problems, so frequently mentioned, pertain to student interest and motivation. It thus seems that the major problem of the teacher is to interest the child so that he will pay attention and be so interested in his work that he will attack it with sustained effort.

The following discussion will attempt to set forth and evaluate the facts about various methods used to stimulate achievement. Many questions can be raised—and answered to some degree—on the effectiveness of rewards, praise, scolding, recognition, rivalry, purposes, knowledge of progress, and other factors that influence achievement. For example, are there differences in how these influences affect dull and bright children, younger and older pupils, boys and girls? Furthermore, some of the factors may have a desirable effect when first applied but, if continued, will have little influence and sometimes even an adverse one. Many phases of the problem of interest, attention, incentives, and motives must be considered.

Passive and Active Attention. The attention of the car driver to the turns in the road, the markers along the way, the location of certain stations, and other places along the road differs from that of a passenger who may be sitting beside him every time that he makes the trip. The driver pays active attention because he is responsible for getting to the destination. The passenger does not have this responsibility, and his attention is passive. The driver can give many details about the road of which the passenger has made no note.

Much that is about us we do not observe in an active way because

we do not look with a purpose. When a teacher of nature study points out certain birds, flowers, and trees, observation becomes active and that which was not seen before is now noted. Interest is stimulated and increases in its intensity. A mind-set and a definite intent to learn take the place of passive and untrained attention.

Incidentally, mere repetition does not result in memorizing what is repeated. For example, in learning a series of nonsense syllables that were repeated orally to the subjects many times by the experimenter, it was discovered that the experimenter could not repeat from memory a series that he had repeated over fifty times, whereas the subjects, who had a mind-set for learning them, acquired the series in less than one-fourth as many repetitions. Experiences like this have been observed in a number of similar situations and verify the general conclusion that intensity of interest and will to learn are basic to efficient learning.

There are many situations in life where little learning occurs because no active attempt is made to learn. The teacher reads sets of directions over and over again that she could readily learn and conveniently give from memory if she tried. Many speakers use notes or outlines that they could easily memorize if they actively attempted to do so, thus avoiding the handicap of having to glance at notes. Active attention to peoples' names, accompanied by earnest attempts to remember them, enables some persons to remember an unusually large number; to a considerable extent, this is a matter of attention. In many of life's situations the will to learn results in the acquisition of facts and material that usually are passed by unnoticed.

Study of the attention of students indicates that it is weak a considerable proportion of the time. College students in arts, commerce, and law were asked to indicate the percentage of class period in which their attention was high, medium, and low. Such a method of ascertaining the evidence is not very reliable, but it is better than mere guess or speculation. There was considerable variation among the students, some reporting high percentages, others reporting low. The median percentage for each college group, classified according to whether attention was low, medium, or high, is as follows¹:

	High	Medium	Low
Law.....	79	13	11
Commerce.....	29	52	20
Arts.....	20	65	22

¹ Adapted from Knight and Remmers, 1923.

According to these data, during 79 per cent of the class period the attention was high in the case of the law students. It was high during 29 per cent of the class period in the case of the commerce students and during 20 per cent of the period in the case of the arts students. The table can be read correspondingly for medium and low attention. These are averages and give the general amount of the various intensities of attention.

There are many conditions that may cause attention to vary. Some teachers are more interesting than others; also, they may vary from day to day in their power to interest the student. Topics and lessons differ in the degree to which they attract interest. Advanced students probably are more active in their interest than are beginners.

Even though results would differ from class to class, the fact probably is that attention during a class period fluctuates considerably and is at a comparatively low ebb much of the time. The mind often wanders, and the energy of the learner is not concentrated on the topic at hand as much of the time as is necessary to reach a high state of efficiency. The educational problem is to motivate and interest the pupils so that their attention will be more effective.

How to Ensure Attention in Class. When Edmiston and Braddock checked on the amount of the class time the pupils were paying attention, they discovered that it varied according to what was taking place in class and ranged from 80 to 88 per cent. Of course, there are classes where active attention is not so good as this, and there may be some where it is better.

It was observed that attention was highest when the students made reports and lowest in the laboratory. In between these extremes in order of amount of attention was demonstration, general discussion, workbook, lecture, rapid-fire questions, and general discussion by the teacher.

It is probable that in other classrooms the various activities would not gain attention in the amounts discovered in this experiment. Attention is sure to vary with the subject and teacher.

However, certain ideas about effective teaching seem to have emerged from this study. They are as follows: (1) There should be definite, clear assignments so that both teacher and pupil know what is to be done. (2) Both teacher and students should be thoroughly prepared. (3) Classroom methods should include the audiovisual. (4) There should be extensive student participation in the classroom. (5) Whatever takes place in the classroom should be related to the work at hand. By utilizing these ideas the teacher can stimulate maximum pupil attention.

Rivalry and Competition. The school uses many contests in which rivalry becomes keen and tense. Athletics, probably more than any other school activity, is based on rivalry, both individual and group. The participants strive to defeat their opponents either as teams or as individuals. As a member of a team the player is stimulated by the desire to improve his individual record as well as to have the team win. The baseball player wants to have a higher batting average than that of other players; the football player aims to make the most touch-downs; and the basketball players work for individual high scores as well as for team victory. Thus, in athletics there is almost always individual rivalry as well as team rivalry.

In the more conventional subjects, also, rivalry appears in one form or another. Children compete against each other to obtain higher scores in the examinations and higher marks on the report cards. The older form of spelling contest was competitive—side against side and individual against individual to see who would be the lone survivor. In everyday spelling lessons the individual child strives to obtain the highest mark. Contests in debate, declamation, and music bring out the spirit of sharp rivalry.

Because the rivalries in contests have become so acute that hard feeling and critical spirit have developed, the use of contests to stimulate achievement is not so common as formerly. In some states, debate, dramatic, and musical contests of a state-wide nature were sponsored. Today, less emphasis is placed on the contest and more on festivals and clinics. The spirit thus developed is less the spirit to win and more the spirit to learn by receiving help and guidance.

Rivalry, or competition, has the virtue of causing those engaged in it to concentrate their energies on the activity that calls it forth. Psychologically, rivalry has been found effective because it increases achievement. But from a philosophical point of view a question may be raised about the desirability of using rivalry to a great extent, for it may develop the competitive or individualistic spirit to an excessive degree. Having raised that point, we shall leave it, however, and turn to examine the effectiveness of rivalry in stimulating achievement.

Competition and Cooperation. An experiment whose results show the effectiveness of rivalry is one set up to discover the comparative results when an individual works for his own record in competition with others and when his score is combined with that of his group and compared with the score of another group.

The material used for the abilities tested were simple addition combinations of single digits, such as $2 + 3$ and $4 + 8$. Because of the

simple nature of the tasks the amount accomplished was a good indication of effort and thus of the interest in the work.

The children taking part in the experiment were tested under four conditions: (1) unmotivated; (2) working for self; (3) working for the group; (4) choice of working for self or the group. Thus, this experiment furnished an opportunity to test accomplishment under individual and group competition or cooperation and also the extent to which the pupils chose to work for themselves rather than for the group. Included were 1,538 children of the fifth, sixth, seventh, and eighth grades and of the age range from eight to seventeen.

The pupils were first tested to discover what their accomplishment was without any particular motivation. The scores constituted the basis for comparing the self-motivated and group-motivated scores. When the competition was individual, or the motive was for self, each pupil was told that his score would indicate his rank as first, second, third, down to the last, and that the fastest would be given a prize.

In the test of the strength of group motive the students were organized into classes and urged to work hard for the prizes that would be given to classes having the best scores on the addition test. The children wrote the name of their class on the paper and not their individual names. The individual competition was greatly reduced, if not eliminated; thus, in this case the group, or class, competition was a cooperative attempt of the members of one class to beat the members of the other.

In another competitive situation the pupils were permitted to choose whether they wanted to work during units, a minute in length, for themselves or for the group. There were seven 1-minute units, and thus there could not be an equal division between self and the group.

Table 10 contains the scores for practiced, self-motivated, and group-motivated children and the differences between the groups. When the student was motivated by the desire to win the prize for himself, he did best; the amount accomplished in working for the group was greater than in working without motivation but not so great as in working for self (self-motivation). It should be emphasized that the differences are for the amount accomplished in 1 minute; hence, because of the short period involved, the difference is really a large one. At the rate of the average difference of 2.9 given for 1 minute the difference for 10 minutes would be 29.

Motivation, both for self and for the group, is effective, but pupils work harder to gain a high ranking and to win a prize for themselves than they do to win standing and a prize for their class. Consistent

with this result is the tendency of pupils to work for their individual score rather than the group score when they have an opportunity to choose whether they wish to continue to work for themselves or for the group. The ratio was about 3 to 1, 74 per cent of the choices being for self and 26 per cent for the group. Thus, the pupils choose most often the motivation that is most effective.

Another investigator also found that rivalry was effective in stimulating achievement. Children of the fourth and sixth grades were used as subjects, and the tasks were arithmetic problems. One group, known as the *control*, were given the tests by themselves but urged to

TABLE 10. ARITHMETIC SCORES OF GROUPS WITH DIFFERENT MOTIVATION*

School	No. of cases (total, 814)	Practice (unmotivated) group	Self-motivation (competition)	Group motivation (cooperation)	Self-motivation over unmotivated group	Group motivation over unmotivated group	Self-motivation over group motivation
I	314	44.8	50.1	45.6	5.3	0.8	4.5
II	223	37.3	43.0	40.4	5.7	3.1	2.6
III	277	41.0	45.9	44.4	4.9	3.4	1.5
Average	...	41.2	46.3	43.6	5.1	2.3	2.9

* Adapted from Maller, 1929.

try as hard as they could. The others, known as the *experimental section*, were divided into two competitive groups who competed against each other. The scores of each group were written on the board as well as announced orally. A strong competitive spirit developed during the period of rivalry. It will be observed in Table 11 that the control group gained little, remaining on a relatively constant level. The rivalry groups made all their gain at the beginning and showed no

TABLE 11. SCORES IN ADDITION TEST OF CONTROL AND RIVALRY GROUPS*

Day	Groups	
	Control	Rivalry
First.....	7.43	7.24
Second.....	8.12	11.00
Third.....	8.19	11.26
Fourth.....	7.99	11.17
Fifth.....	8.06	11.39

* After Hurlock, 1927-1928.

improvement thereafter, having apparently reached in the simple processes of addition the limit of their achievement at the beginning.

In this experiment the younger children improved their scores more than did the older ones, and the duller children also responded more to rivalry than did children of average and superior ability. Because the scores of the inferior are low at the beginning, more gain is possible; and when expressed in percentage, a smaller gain may make a larger percentage of gain than the larger gain for a brighter person whose initial score is higher. Thus, a gain from 5 to 7, or 40 per cent, is relatively larger than a gain from 12 to 15, or 25 per cent.

The results of the various experiments on individual and group rivalry tend to indicate that young children respond more to group rivalry than do older children, who are stimulated more by individual competition and the desire to win for self rather than for the group. This change in motivation is probably brought about by the emphasis placed by activities in and out of school on individual accomplishment rather than cooperative endeavor and group achievement. The general morale of our society is based on competition and rugged individualism. Stories emphasize the struggle of the individual—the poor boy who struggled and gained success for himself. The marking system, praise and reproof of the individual, and individual achievement are stressed so that individualism is developed and causes working for self to be a greater motive than working for the group. Conceivably, if cooperation were emphasized in the school procedures, the cooperative attitude could be developed so that the desire to work for the group would be increased.

The effectiveness of incentives in the forms of prizes, captaincy of groups, and ranking substantiates, in general, the results from other experiments showing that pupils working with definite incentives in mind achieve more than they do ordinarily. Thirty-five children of a 5A class were tested with multiplication problems of two digits by two digits for 7 weeks on Mondays, Wednesdays, and Fridays. In this experiment their usual achievement was first established by ascertaining the number of problems done without incentives. Then the children were tested to determine their scores when they were working for 5-cent chocolate bars, for captaincy of the class, and for other ranking in the class. The name of the person with the highest score was announced as captain, and the ranking of each person was written on the blackboard next to his name. There were four situations in which the achievement was tested, as follows: (1) no incentives; (2) chocolate bars; (3) captaincy and ranking in the class; (4) combination of the incentives given in (2) and (3).

A comparison of the achievement with and without incentives is shown in Table 12. Rivalry score refers to the score made when the pupils worked to become captain or obtain a high rank in their class.

TABLE 12. AVERAGE NUMBER OF PROBLEMS WORKED WITHOUT INCENTIVES AND WITH SEVERAL KINDS OF INCENTIVES*

	No incentive	Prize of chocolate bar	Captaincy and ranking	Several incentives
Mean.....	23.6	35.9	34.6	38.9
Gain over no incentive .....	....	12.3	11.0	15.3
Percentage of superiority.....	....	52.0	47.0	65.0

* Adapted from Leuba, 1930.

In this experiment, too, the pupils in the lowest quarter made the highest percentage of gain. Apparently, when students are spurred by incentives, their achievement is increased considerably. Most experimenters have found this to be the case. In this experiment a combination of incentives proved to be most effective.

When a person works for a prize, which in this instance was a chocolate bar, it is doubtful that the intrinsic value of the prize lures the student to his highest achievement. Except when the prize is worth a large amount—and even then in not all instances—the desire is not to have the prize but rather to gain the distinction of winning it. This is evident from the fact that the children did about as well to obtain a high rank as they did to win chocolate bars. The feeling of social recognition and of satisfaction that comes from winning is the most fundamental of incentives and motives. The boy or girl wants to be known as a winner, or one who ranks higher than the other boy or girl.

The Effect of Working in a Group and of Working Alone. Some pupils are stimulated by the presence of their fellows and do better in a group; others can accomplish more when they work alone. Then, again, differences exist according to the task, some kinds of work being best done alone, others being done better in a group. When a person is writing a book or conducting a complicated experiment, he seeks privacy; but in mechanical types of work, as in much of factory work or in phases of work in physical education where rhythm is a factor, group work is most effective. In this connection, it should be pointed out that this discussion does not pertain to group and individual competition or rivalry. It refers merely to individuals as being in and working in a group in distinction to those working without the presence of the group.

The evidence does indicate differences in achievement in working under the social influences of the group and in working alone. In general, work more mechanical in nature is done better by an individual in a group than when he is alone, but work that is complicated and difficult is usually done better alone than in a group. Speed is a more important factor in simple tasks, and it is stimulated by the presence of others. Difficult problems requiring more careful reasoning and reflective thinking are done best away from the presence of the class.

As is true in almost all situations, some individuals differ from the general trends. Some types respond better to the group situation than do others; the poorer students, for example, respond more readily when they are in a group, whereas sensitive persons do better alone. It matters, also, how the group is involved in the situation and the relationship of the individual to the group. If the group acts as an audience or in some other way that causes the individual pupil to be sensitive to it, some pupils, because of such a sensitivity and of particular weaknesses, are influenced unfavorably. Others, in turn, are by similar circumstances stimulated by the group to effective responses.

On the whole, whether the individual works in the presence of others or alone, the differences are not very large. Variations occur among individuals. In general, however, the highest quality of work is done by working alone when the tasks are difficult; when quality and difficulty are not involved to so great an extent and high speed is desirable, working in a group is most effective.

The Effect of Praise and Reproof on Achievement. Some teachers and parents are given to speaking pleasantly and approvingly to children; some are inclined to blame or reprove them; others are neutral, being neither positive or negative. Words are used to approve or disapprove the behavior of children in order to improve it. The teacher who praises a child for his work does so in order to stimulate him; even more, when she reproves him, she does so to check undesirable behavior or to spur him to greater achievement.

In this connection, it may be pointed out that one of the distinguishing features of very good and very poor teachers is the nature of the responses that they make to the efforts of their pupils. The superior teachers nod approval, speak encouragingly, and in general react positively. The poor ones, on the other hand, are inclined to be negative in their reactions, deprecating their pupils' efforts, scolding them, and finding fault with their work. Of course, these are not the practices that cause some teachers to be good and others poor; rather, they are symptomatic of good or poor teaching. On the whole, com-

mendation is more effective than faultfinding, but merely changing one's tactics in this respect would not make a good teacher out of a poor one or a poor teacher out of one who is now effective. But let us turn to the evidence on the effectiveness of praise and reproof on achievement.

The typical experiment consists in having groups of pupils working on tasks when praised, scolded, and neither praised nor scolded. In one experiment a group present in the room was ignored when the other groups were either praised or reproved—nothing whatever was said to the ignored group.

An experiment often referred to is one with an arrangement like that just described, with a praised, a reproved, an ignored, and a control group. Over a period of 5 days, pupils of the fourth and sixth grades worked addition problems of six three-place numbers. All the students of the experiment were first tested and, on the basis of their scores, divided into four groups, a control, a praised, a reproved, and an ignored group. The control group was placed in a separate room, but the praised, reproved, and ignored groups were given the tests in the same room.

The praised group was commended in the presence of the reproved and ignored groups. The name of each member was read, and in response the pupil came forward. Then the praised group was commended for its effort and achievement. When praised, it was also urged to do its best and improve its record. The same procedure was used for the reproved group. It was scolded for its carelessness, poor work, and failure to improve. The members of the ignored group were present in the room with the praised and scolded groups and listened to the treatment that each received. Nothing, however, was said to the ignored group.

The results are given in Table 13.

TABLE 13. AVERAGE SCORES MADE ON ARITHMETIC TESTS BY GROUPS WORKING
UNDER DIFFERENT INCENTIVES FOR A PERIOD
OF FIVE DAYS*

Groups	First day	Second day	Third day	Fourth day	Fifth day
Control.....	11.8	12.3	11.6	10.5	11.4
Praised.....	11.8	16.6	18.8	18.8	20.2
Reproved.....	11.8	16.6	14.3	13.3	14.2
Ignored.....	11.8	14.2	13.3	12.9	12.4

* After Hurlock, 1925.

The achievement of the control group, which worked by itself, remained on a level; it is surprising that it did not decline. Apparently, these pupils did their work with no increase or decrease in enthusiasm and effort. The ignored group showed a little improvement at first, but the effect of witnessing approval and disapproval apparently dissipated it.

It is a most interesting fact that the initial improvement of the praised and reproved is the same. The effects of scolding soon wear off, however, and there is a decline, though not to a level below the initial score. In the case of the praised group the trend is toward a slow but steadily increasing achievement after the first initial spurt.

These results show that praise is most effective and reproof next. Being ignored in the presence of praise and reproof results in a little better achievement than when pupils work by themselves with no particular stimulation of any kind.

Further analysis indicates that praise influences the poor students most and that reproof has an unfavorable effect on them. Reproof, on the other hand, may have a desirable effect on some of the brighter children, although on the whole praise is better. Poorer pupils need praise and encouragement, but the bright are so accustomed to "easy sailing" that reproof may spur them to better work.

The teacher needs to exercise discrimination in the use of praise and reproof and also to be selective in its application. Either one used in excess or in a perfunctory manner may cause it to be not only ineffective but even negative in its effects. An occasional scolding and reprimand may stimulate a desirable response; but if often repeated, they will lose their effectiveness. Praise is effective for a longer time, but it, too, may easily be overdone. Pupils also differ individually in their responsiveness to both commendation and disapproval. Thus, praise is best for one and reproof for another. A few pupils are badly upset by unfavorable criticism; others are callous to it. If the teacher studies her pupils carefully, she can discover their reactions to her criticism, favorable or unfavorable, and can treat them accordingly.

It has been sensed by some psychologists and educators that praise is not always effective and that blame is not always detrimental, in fact, is no less effective in some cases than praise. The suggestion has penetrated through various investigations that praise is better for some people and blame may be better for others. The factors of introversion and extroversion have been suspected as being related to the relative effectiveness of praise and reproof.

An experiment with fifth-grade children by Thompson and Hunnicutt tested this idea. The children were first given an introversion-extro-

version test and on the basis of the scores were classified as introverts and extroverts. They were then given a cancellation test, which consisted in rows of Arabic numbers from 0 to 9 printed in random order in rows. The children were instructed to draw a line through the 7's, in other words, to cancel out the 7's, found in the rows of numbers. This is not a difficult or complex task, and attention and effort determine to a large extent the scores that the pupils attain.

The pupils were tested six different times by this cancellation test. P, poor, was put at the top of the test papers of one group, and G, good, was placed at the top of the test papers of another group, and these marks were placed at the top of each paper of the same pupils for all the tests except the last test, when all received G. Thus there was one group of children that received P, poor, all the time, except for the last examination; and one group received G, good, all the time. One group was blamed or scolded in effect, while the other group was praised. There was a third group, a control group, and no comments were made about their test results and no mark written on their papers.

Certain important findings of this study should be emphasized. Both blame and praise increased achievement. Both the blamed and praised groups did considerably better than the control group, and the blamed group did slightly better than the praised. A question might be raised, however, about the effect of blame over a long period of time. It is conceivable that negative effects might set in.

The point to be emphasized in this experiment is the effect of blame and praise on extroverts and introverts. Blamed extroverts and praised introverts gained the most and did about equally well in the test. Praised extroverts and blamed introverts gained about equally but did considerably poorer than did the blamed extroverts and the praised introverts.

In short, blame stimulates extroverts to improve their achievement but does not have a good effect on introverts. Praise, on the other hand, has a good effect on the achievement of introverts, but praise does not have a stimulating effect on extroverts. Possibly extroverted people have received more praise during their lifetime and respond less favorably to it, therefore, while the introvert has been found fault with more and consequently is stimulated by praise and not by blame.

These results suggest that the teacher should use blame and praise discriminately in terms of the individual child. The more sensitive, retiring child who lives in his own world will probably respond favorably to praise. In fact, approval is good for him not only because it will improve his achievement but also because it will do him good emotion-

ally. The extroverted child, the one who is forward and aggressive, will probably be improved by being blamed or reprimanded. At least, the teacher should make him feel responsible for doing better than he is doing at present. Blame and reproof should not be used with an extrovert to the point where the child feels that the teacher is "picking on him." That is bad for any child. The teacher should recognize the differential effect of praise and blame on pupils and adapt her methods accordingly.

Knowledge of Results. With some methods the pupils hardly know how they stand. They are not certain that they are making progress; what their relation is to others in the class; or whether their work is highly satisfactory, moderately satisfactory, or barely satisfactory. Report cards indicate a child's status in a general way, but they are issued only once a month or every 6 weeks. Furthermore, they are becoming less specific, indicating only approximately whether the work is satisfactory or unsatisfactory.

A common complaint of pupils is that their teachers do not return their papers. Students wish to have their written lessons and examinations marked and returned, so that, in addition to profiting from the corrections, they also will know to what degree they are successful. They want a knowledge of results.

Graphs and records are sometimes kept of pupils' achievement in spelling, reading, arithmetic, athletic contests, and other school activities so that they may know the results of their work. These charts are kept by the students or posted in the classroom. They watch their curves and are motivated to improve. They have knowledge of their own progress and that of their classmates; consequently, they work to beat their own records as well as those of their classmates.

Objective Evidence on the Effect of Working with and without Knowledge of Results. A number of experiments have been conducted during the past 20 years to test achievement when students have a knowledge of results and when they have not. The results are consistent in showing that a knowledge of achievement or the scores obtained during the course of work operates positively to improve achievement. Grade-school, high-school, and college students have been subjects in the experiment, and the results are positive for learners of all degrees of maturity.

The scores in Table 14 indicate the achievement with and without motivation, when the material involved was English usage and the object was to find the errors in sentences ("We was on time" and others

of that type). The subjects were sixth-grade children in certain New York schools.

TABLE 14. GAINS OF NONMOTIVATED AND MOTIVATED PUPILS IN ENGLISH USAGE*

	Gains		
	Manhattan schools	Brooklyn schools	Weighted average
No motivation:			
One repetition.....	— .31	+ 1.07	.496
Three repetitions.....	+ .86	+ .76	.794
Five repetitions.....	+ 2.09	+ 1.33	1.540
Ten repetitions.....	+ 4.73	+ 3.01	3.764
Test motivation with three repetitions..	+ 4.35	+ 2.08	3.028

* Adapted from Symonds and Chase, p. 31.

The motivation in this experiment consisted in the individual's trying to improve his own score because of a knowledge of the scores that he was making on the tests. In addition, he was given his standing in the class and also the standing of the class in comparison with other classes. Thus, he was working to improve his own score, to outstrip his fellows, and also to improve the position of the class.

Three repetitions with motivation are not so effective as 10 without but decidedly more effective than 5 nonmotivated repetitions. The data in Table 14 show that repetition of practice is effective; but when coupled with the motivation of improving known scores, practice is clearly more effective.

Interest and Ability. Generally, when we begin a task, we must "drive" ourselves. When the work is difficult, which it usually is at first, we tend to turn away from it. Thus, when a student begins the study of a language, takes up the piano, or begins work in other fields, he finds the work rather distasteful at first. If he persists, however, and acquires competence, his attitude toward the work will change. Interest develops and stimulates activity, and thus it is proved again that "nothing succeeds like success."

In the older psychologies, emphasis was placed on "striking while the iron is hot." According to this theory, there are certain periods when children have certain interests, and these periods should be capitalized on. The weakness in this psychology is that there probably are no specific and definite periods when different interests burn brightly.

Another point of view is that *we should strike until the iron becomes hot.* There may be little interest at first; but if we prod ourselves and

develop ability, we become interested. Much that we do as regular routine—reading, typewriting, piano playing—was once hard, discouraging work; but when a certain degree of ability was attained, interest increased correspondingly. Thus it is with specialists in any field—medicine, law, chemistry, psychology—when they acquire competence; many features of their work become very fascinating. Interest and drive are concomitants of acquired ability.

Reasons for Lack of Interest. High-school students lose interest or never acquire an interest in their studies for reasons that center in the subject, in themselves, and in the teacher. Probably the foremost reason is that the student sees no reason why he should be studying a subject. He sees no need for it. He also finds the material uninteresting and too hard, which may be his fault in that he does not work hard enough or has not the capacity to do well in the subject, or the teacher's in that she does not teach well enough to make it interesting.

In fact, the teacher is often blamed by the student for his lack of interest. The student declares that the teacher is monotonous, explains poorly, has no enthusiasm herself for the subject, and is unable "to put the subject across."

The responsibility is divided, actually. The student should work hard enough to develop interest if at all possible. The teacher should explain to the pupil what need and purpose a subject actually serves and should teach it so well that the student learns the subject and gets interested in it. Usually a student's degree of interest in a subject is in proportion to the teacher's personality and her power to arouse enthusiasm.

Threat of Failure and Learning. Related to the problem of marking pupils' achievement is the problem of promotion. Formerly, when pupils had low marks, they ordinarily were failed; when their marks were satisfactory, they were promoted to the next grade. During recent years, however, there has been a definite trend toward lessening the number of failures; in some schools, children are rarely, if ever, retained in a grade to repeat the work in which they have failed.

A question may be raised concerning the effect of this policy on the industry and achievement of the pupils. Some teachers insist that if the threat of failure is not held over school children they will not work hard on their lessons and that it is necessary to fail some in order to cause all to put forth their best efforts. Other teachers feel that students can be motivated in other ways and that many work even harder when they know that next year they will be in the next grade and have to do more difficult work.

The value of the threat of failure as a motive has been tested. Nine teachers, when teaching the students, warned them about the danger of failure and occasionally threatened them with that penalty. Nine other teachers in this experiment, however, made it clear to their students that there would be no failures and that everyone would pass. The awareness of the two groups of the policy that applied to them was adequately maintained, but no more than that. The pupils in this experiment were of the second and fifth grades. They were tested at the beginning of the semester and at the end, in order to check the effect on achievement of the policy of impending failure and no failure. It was discovered that the difference in the achievement of the failure and nonfailure groups was very small—probably inconsequential. If there was any superiority whatever in achievement, it lay with the nonfailure group. When analysis was made to determine the effect on students of different levels of intelligence, it was also discovered that there were very small and unimportant differences.

When the teachers were asked to indicate the reactions of the pupils, a few replied that some worked better when they knew that they were to be promoted; on the other hand, when some pupils felt that they would not pass, they developed the attitude "It's no use anyhow!" Other teachers felt that some pupils became slack when they knew that they would pass no matter how poor their work. Some teachers found no change, others felt that conditions were improved, and others again felt that the classroom situation was poorer. Such wide diversity of opinion is more or less consistent with findings that indicate that a nonfailure or a failure policy makes comparatively little difference in the actual classroom achievement of the pupils. The advantage of any policy on failure or no failure will probably be found in its effect on the feelings and characters of the pupils. Such a policy will have to be tested over a long period of time in order to yield definite results.

Desirable Characteristics of Incentives. An incentive should cause the student to focus his energies on the task at hand. This is usually accomplished if the goal is clearly in mind and if the learner feels a real need.

Thus, the goal should be within reach. Some students, for example, are not encouraged by the desire to be on the honor roll, for they know that they have no chance of this. Similarly with school marks—comparatively few are motivated by them, for many have given up aspiring to high ones. Incentives should be adjusted so that they encourage all students to work harder.

Motives and incentives vary according to sex, brightness or dullness, and age of the learner. Devices used in the kindergarten to stimulate kindergarten children would cause college students only to smile. There are basic similarities in the recognition given the achievement of old and young, but the incentives for children are more apparent. Similarly, bright and dull children differ, for example, in their response to praise and blame. Still, all motivation that results in the learner's acquiring prestige or a feeling of worth is nearly always effective.

The motive or incentive is often made the end rather than the means. The consequence is that the attitude toward the tasks at hand is not in the form of deep-rooted interests. Instead, the students work for the prize, school mark, praise, or whatever the incentives happen to be. Thus, a student works for a high mark rather than competence in the subject. The purpose of incentives and motives is not to increase the effort devoted to incentives and motives themselves but to cause heightened interest in the tasks at hand.

In this connection, it may be added that good will ought to result from the use of incentives. If rivalry is used, does it result in sharp practices and hard feeling? Also, if prizes, such as medals, badges, gold stars, and certificates, are used to give distinction, do they lead to feelings of jealousy, selfishness, and excessive individualism? Incentives and motives should be evaluated as to their effect not only on achievement but also on the attitudes and emotions they evoke.

VISUAL-AUDITORY AIDS AND LEARNING

In some schoolroom situations the efforts of the teacher are supplemented with visual aids. These aids, among others, take the form of slides, motion pictures, museum displays, maps, and models. Of special interest in this connection during recent years have been motion pictures for the schoolroom, many of which are now accompanied by sound. There is hardly a large school system that does not make use of motion pictures in the classroom.

As is true of all new teaching devices and techniques, visual aids are tested to determine the extent to which they facilitate learning. In the old psychologies, stress was laid on teaching through all the senses, and evidence even appeared to the effect that some learners were eye-minded, whereas others were ear-minded, and some learned primarily through the sense of touch. Subsequent research, however, indicated that learners could not be classified definitely in this way. As a consequence, emphasis has been placed on teaching through all the senses by means of rich and varied experiences.

The motion picture teaches through the eye and through the ear also. It is said of motion pictures that they impart to children a sense of the dynamic relationship of things and develop a capacity for clear visualization of the concrete and objective instead of indefinite mental pictures produced by meaningless verbalisms.

Learning Geography and General Science with and without Films. The value of motion pictures could not be known until they were tested, and this has been done in a number of instances. Over 15 years ago an experiment was conducted to test the value of motion pictures for geography and general science. About 7,500 children in geography classes and 3,500 in general science classes, with nearly 200 teachers, in 12 cities, were included in the experiment, which extended over a half year's time, or a school semester. The films on geography dealt with such topics as New England fisheries, wheat, cotton growing, and iron. Those on general science were on atmospheric pressure, water supply, sand and clay, and reforestation.

In about one-half the classes, films were not used in teaching the various topics covered during the semester of the experiment; in the other half, they were used. Tests were given at the beginning and end of the experiment in order to discover the gains made; comparison of the two groups indicated the effectiveness of the motion-picture films. All the teachers were given the same outlines and covered the same topics in their teaching. Some of the tests used were objective in nature, and a modified form of the traditional essay examination was also used.

The purpose of the testing was to determine the knowledge gained by the pupils from instruction and also to test their ability to reason and think on the basis of the knowledge that they had obtained. In the comprehensive, or objective, test, the experimental group gained more than did the control, indicating that the motion pictures were effective. The gains were not much larger, but of most significance was the fact that the group taught by help of films was consistently superior. This consistent superiority in the differences is probably more important, for the time being, than the amount of superiority.

In the topical, or essay, tests the results corresponded to those obtained with objective, or true-false, multiple-choice tests. The difference in general science was equivalent to 23.2 per cent of the standard deviation of the scores; in geography, to 29.3 per cent of the standard deviation. The superiority of the group taught by the use of films was found in 9 of the 12 cities and, in the case of geography, in all 12 cities.

In addition, the teachers were asked various questions by means

of questionnaires, and most of them replied that the films had proved effective. From both the testimony of teachers and the experimental evidence, it is safe to conclude that learning is definitely improved by the use of films in the classroom.

Visual Aids and Learning Latin. The use of visual aids also resulted in improvement in Latin. Two small groups of students had the same teacher and the same textbook and, as far as possible, were taught in the same way, except that one group was taught also by the help of stereopticon pictures. By means of these, objects were depicted on the board, and the Latin words associated with them were also presented. In short, objects and their Latin names were shown; when the pictures were removed from the board, the words remained, and the students were questioned about them. Slides were used extensively to present words and sentences in order to teach them to the students.

The control group was taught in the same way as the experimental, but without the help of stereopticon pictures. The results were clearly in favor of the group whose teaching had been supplemented by visual aids, which in this instance were comparatively simple. Over a period of less than a month, the experimental group gained 113.7 words, but the control group gained only 93.9. In addition, the number of errors in English translation were 10.2 and 23.2 for the experimental and control groups, respectively. Those who were taught by visual aids also made fewer errors in grammar and were much more attentive. Thus, over a comparatively short time, the visual aids proved their effectiveness.

Other Results from Visual Aids. In Pittsburgh, two experiments were conducted to test the value of visual aids in the teaching of fifth-grade geography. It was discovered that motion-picture films increased learning of information by about $14\frac{1}{2}$ per cent more than with the use of lantern slides, still films, and stereographs alone, and that the use of all these visual aids increased the acquisition of information about 23 per cent more than when no such visual aids were used.

Most results are consistent in showing that visual aids increase the amount that pupils learn. Knowlton and Tilton studied the effect of the use of *Chronicles of America Photoplays* in teaching junior high-school pupils. Ten photoplays were used; on the average, the gains were about 25 per cent more; the amount retained after 3 months was about 27 per cent more. Tests designed to measure the interaction of events and forces showed an increased learning of 35 per cent, and the knowledge of historical personages showed an increase of 23 per cent.

Other experiments have been conducted, and all are practically

unanimous in showing the great values of motion pictures, slides, illustrations, and various other forms of visual aids. Good teaching can be achieved by varied and vivid presentation, and learning can be improved materially by extensive use of these devices.

The evidence is clear in showing that visual-auditory aids stimulate interest and increase learning. Some forms of audiovisual aids may have advantages over others, but the problem is to get maximum results. This can be done by using a variety of aids—silent and sound motion pictures, slides, the radio, phonographs, charts, maps, specimens, demonstrations, apparatus, pictures, art galleries, and museums. Of course, text- and reference books should be used, and there should be discussion and recitation. Then if the student is tested on the topic under consideration, achievement is likely to be higher than if no special audiovisual aids were used.

SUMMARY AND REVIEW

When people are highly motivated they work intensively and accomplish much more than they do when working in the usual routine manner. Rivalry causes people to work hard in order to achieve prestige and a feeling of personal worth.

The teacher regards as her major problem the problem of interesting her pupils.

Passive attention is weak, while active attention is strong and concentrated. Attention in the typical classroom varies greatly, some being very high or active, while some is medium and others low or passive.

Attention varies with the kind of activity in the classroom—reports, demonstration, discussion, workbook, lecture, question and answer, and discussion by the teacher.

Rivalry tends to bring out maximum achievement, but it can cause an excessive desire to win and bad feeling.

Children work harder in competition when they are working for themselves than when they are working for group achievement. The unmotivated accomplish least. Working for prizes stimulates efforts, but it is possible that the feeling of worth that comes from winning the prize constitutes greater motivation than the intrinsic value of the prize.

Some activities, such as sensorimotor activities, are stimulated by a social situation and by the presence of others, while complex activities requiring intense concentration are done best when engaged in alone.

Praise tends to produce more improvement than does reproof.

But praise affects introverts more favorably, and reproof affects extroverts more favorably. Praise helps poor students more than able ones.

Pupils should have a knowledge of how they are progressing, for such knowledge usually causes them to work harder.

When pupils become more competent in a subject, they tend to become more interested, for ability tends to stimulate interest.

The teacher is responsible for stimulating interest. If she has a good personality and good teaching skills, she will probably stimulate her pupils to strong efforts.

In some schools all pupils are promoted, and in some there is a proportion that are failed. It has been found that students achieve just as much and possibly slightly more when they know they will pass as they do when they know there is a possibility of failure.

Incentives should appeal to students of all ages and abilities. The incentives should be the means and not the ends and should not lead to bad feelings.

Experiments are consistent in showing that audiovisual aids stimulate learning. Consequently, teachers should use films, slides, maps, models, the radio, phonographs, and museum materials.

Test Your Thinking

1. When teachers state that their major problem is to stimulate pupil interest, they are saying that they find it difficult to see that their pupils attend to their studies. What should a teacher do to achieve this?
2. Describe both effective and ineffective attention. Give some examples.
3. When we are awake, we are always attending to something. In class or in studying we should attend to the teaching in order to ensure the greatest amount of learning. Thus we should attend a minimum amount to stimuli that are classified as distractions. Comment on the usual attention in the classroom and also in studying.
4. What conditions are conducive to more effective attention in class?
5. Compare the effects of competition and cooperation on learning.
6. Describe what you think is an ideal situation involving incentives and motivation.
7. How can you apply the knowledge we have of the effectiveness of working alone or working in a group?
8. Teachers approve and disapprove; they praise and scold. What are the psychological facts about this practice?

References

- BARR, A. S.: *Characteristic Differences in the Teaching Performance of Good and Poor Teachers of the Social Studies*, Public School Publishing Company, Bloomington, Ill., 1929.

- DUNKEL, H. B.: An Inventory of Students' General Goals in Life, *Educational Psychological Measurements*, 4: 87-95, 1944.
- EDMISTON, R. W., and R. W. BRADDOCK: A Study of the Effect of Various Teaching Procedures upon Observed Group Attention in the Secondary School, *Journal of Educational Psychology*, 32: 665-672, 1941.
- FENTON, NORMAN, and VICTOR D. HILL: An Experimental Study of the Visual Method in Latin Instruction, *School Review*, 36: 675-678, 1928.
- FINSTEAD, A.: Evaluating the Motion Picture in Science Teaching, *Nations Schools*, 36: 52, 1945.
- FREEMAN, F. N.: Visual Education from a Twenty-five Year Perspective, *Educational Screen*, 25: 15-16, 1946.
- GOODMAN, DAVID J.: Comparative Effectiveness of Pictorial Teaching Aids, *Journal of Experimental Education*, 12: 20-25, 1943.
- GOODMAN, DAVID J. (ed.): Experimental Research in Audio Visual Education, *Educational Screen*, 23: 262-263, 1944, 1945.
- HANAWALT, N. G., and K. F. RUTTINGER: The Effect of an Audience on Remembering, *Journal of Social Psychology*, 19: 259-272, 1944.
- HURLOCK, ELIZABETH B.: An Evaluation of Certain Incentives Used in School Work, *Journal of Educational Psychology*, 16: 145-159, 1925.
- HURLOCK, ELIZABETH B.: The Use of Group Rivalry as an Incentive, *Journal of Abnormal and Social Psychology*, 22: 278-290, 1927-1928.
- KLUGMAN, S. F.: The Effect of Money Incentive versus Praise upon the Reliability and Obtained Scores of the Revised Stanford Binet Test, *Journal of General Psychology*, 30: 255-269, 1944.
- KNIGHT, F. B., and H. H. REMMERS: Fluctuation in Mental Production When Motivation Is the Main Variable, *Journal of Applied Psychology*, 7: 209-223, 1923.
- KNOWLTON, DANIEL C., and J. WARREN TILTON: *Motion Pictures in History Teaching*, Yale University Press, New Haven, 1929.
- LEUBA, CLARENCE L.: A Preliminary Experiment to Qualify an Incentive and Its Effects, *Journal of Abnormal and Social Psychology*, 25: 275-288, 1930.
- MALLER, JULIUS B.: Cooperation and Competition: An Experimental Study in Motivation, *Contributions to Education*, 384, New York, 1929.
- McCOWEN, M. C.: Controlled Experiment in Visual Education in General Science, *Educational Screen*, 19: 143-146, 1940.
- MUKERJI, N. P.: An Investigation of Ability in Work in Groups and in Isolation, *British Journal of Psychology*, 30: 352-356, 1940.
- OTTO, HENRY J., and ERNEST O. MELBY: An Attempt to Evaluate the Threat of Failure as a Factor in Achievement, *Elementary School Journal*, 35: 588-596, 1935.
- PHILP, ALICE JANE: Strangers and Friends as Competitors and Co-operators, *Pedagogical Seminary*, 57: 249-258, 1940.
- PINTNER, R., and G. FORLANO: The Influence of Pleasantly and Unpleasantly Toned Words on Retention, *Journal of Social Psychology*, 11: 147-148, 1940.

- POTTER, ELMER H.: The Effect of Reproof in Relation to Age in School Children, *Journal of Genetic Psychology*, **63**: 247-258, 1943.
- STADTLANDER, ELIZABETH L.: Relative Importance of Placement of Motion Pictures in Classroom Instruction, *Elementary School Journal*, **40**: 284-290, 1939.
- SYMONDS, PERCIVAL M., and DORIS HARTER CHASE: Practice vs. Motivation, *Journal of Educational Psychology*, **20**: 19-35, 1929.
- THOMPSON, G. G., and C. W. HUNNICUT: The Effect of Repeated Praise or Blame on the Work Achievement of Introverts and Extroverts, *Journal of Educational Psychology*, **35**: 257-266, 1944.
- TRAVIS, R. C.: Length of the Practice Period and Efficiency in Motor Learning, *Journal of Experimental Psychology*, **24**: 339-345, 1939.
- VAUGHN, JAMES, and CHARLES M. DISERENS: The Experimental Psychology of Competition, *Journal of Experimental Education*, **7**: 76-97, 1938.
- WITTICH, W. A., and J. G. FOWLKES: *Audio-visual Paths to Learning*, Harper & Brothers, New York, 1946.
- WOOD, BEN N., and FRANK N. FREEMAN: *Motion Pictures in the Classroom*, Houghton Mifflin Company, Boston, 1929.
- YOUNG, F. M.: Causes for Loss of Interest in High School Subjects as Reported by 651 College Students, *Journal of Educational Research*, **25**: 100-115, 1932.

CHAPTER XVI

MEMORY—REMEMBERING AND FORGETTING

What to Look For. Formulate in your mind some ideas about what the passing of time does to what we have memorized. What materials seem to be remembered better than others?

Learn the factors that influence retention and forgetting.

How do the experiences following a period of learning influence what has been learned? What is the meaning of *retroactive inhibition*?

Does the better learner remember more than the poor learner? Does the person who learns much remember more of what he has learned than the person who learns little, or vice versa?

Some losses of knowledge and skill take place during the summer vacation. How serious are such losses? Note the differential nature of the forgetting.

Note that "bare" facts are forgotten more rapidly, while principles and concepts are retained better.

The importance of the recitation, with its recall and repetition of what is learned, should not be overlooked.

Material learned varies in the degree that it is understood, or in its meaningfulness. What is the relationship between meaningfulness and retention?

What is meant by the term *overlearning*, and what is its relationship to remembering?

How can review be made most effective for preventing losses by forgetting?

Introduction. As we were walking down the street, we noticed a poster that persistently appeared in the shopwindows. A "great psychologist" was in town, and he promised among a number of other things to "liberate the mind" and improve the memory. Those who would take his course would learn and remember as well as he can.

In his free public lectures, which were held in the ballroom of the city's leading hotel, he gave demonstrations of his power to remember the names of a considerable number of persons in the audience who had been pointed out to him. He promised that he could teach them to learn and remember. It is doubtful that the psychologist has any magical method for improving the memory. If his methods are in any

way effective, they would consist of established psychological principles.

As students of psychology we are interested in the most effective ways of learning and remembering.

Forgetting and Retention. Much that students learn and are able to reproduce in the form of adequate answers to examination questions is soon forgotten following the examination. The poems that children learn well enough to recite in class or on a program are quickly forgotten. It is easy to sense how little is retained of that which is memorized if we check ourselves on our ability to repeat the poems and other "pieces" that we learned as children. The poems remembered are probably those which we have had occasion to use or which we have made a habit of repeating. Most of the hundreds and thousands of facts acquired through the labors of pupils and teachers throughout a school career are forgotten.

A story showing how completely time may erase some memories was related by a person who, by chance, found a copy of the play in which he had had a leading part in high school. Twenty years had passed since he memorized and spoke his lines, and he reread the play in order to reacquaint himself with it and, in particular, to go over his own lines. To his astonishment, he discovered that the whole thing was almost completely unfamiliar. It was almost like reading a new play. A period of two decades had obliterated nearly all memory of lines that had once been well learned but that had been neither reviewed nor associated with anything since they had been learned.

Not all material learned or memorized is wiped out over a period of 20 years, but much is forgotten if not reviewed. There are also individual differences in the power of retention, some persons retaining much better than others. However, time will destroy the ability to recall most materials that are memorized, such as poetry, passages, dates, and formulas. General and personal experiences that may be recalled by association and are surrounded with feeling and emotion are not so easily forgotten. An adult may remember many of his boyhood experiences and still forget much that is purely mental, such as the content of mathematics, physics, and history courses.

The course of forgetting takes a definite trend. It is most rapid at first and then slows down. Of nonsense syllables and poetry that have been memorized well enough so that they can be repeated, as much as nearly one-half is forgotten within a few hours. This initial decline is most rapid; after the first day, it is much slower. After 15 days have passed, one-third to one-half of what was known is retained; at the end

of a month, only about one-fourth is retained. These general facts are true on the average, but account should be taken of individual differences.

The forgetting of subject matter or material whose learning is less by rote and more facilitated by association is not so rapid. Nonsense syllables, *sij*, *nuk*, *faq*, etc., are forgotten more quickly because no associations such as cause and effect or time sequence are made while learning them. Historical materials, scientific processes, meaning of words, and other materials are retained better because they are tied together by associations. The recollection of some facts tends to bring up others. Nevertheless, even a large percentage of subject matter learned in school is forgotten. When tested at various periods following the end of a given course, for example, pupils show that the amount retained becomes continuously less.

Sensorimotor skills are retained best; meaningful materials, next; and meaningless materials, most poorly of all. The muscles, figuratively speaking, have a better memory than the mind, and content rich in meaning is remembered better than material with few or no associations.

The loss of knowledge of any subject following the end of a course cannot be described precisely. In the first place, the rate of loss differs a little from subject to subject, and it also differs according to school level. Apparently, the loss in ability of grade-school children is least; the loss by high-school students is a little more rapid; and the loss by college students is greatest of all. Figure 19 contains data on these points. The loss by all groups in various subjects is characteristic of most retention curves in that it is greatest at first and slows down and becomes very gradual a year after the courses were completed. The high loss at first is to be expected, for there is more to forget. The student has built up his stock of knowledge to a high point for the examination. A rapid recession from this high point takes place following the end of a course, which leaves progressively less to be forgotten. The rate of forgetting may vary from subject to subject. Generally speaking, at the end of a year, between one-fourth and one-half is retained; at the end of 2 years, the amount retained is even less, and some loss is still going on.

The smaller loss of grade-school subject matter may be accounted for in at least two ways. In the first place, it is reviewed more frequently than the subject matter in high school or college. Arithmetic, geography, and history, for example, are continued throughout a number of grades; consequently, the loss of an appreciable body of knowledge in any of those fields is less likely because of both incidental and direct learning

in those subjects. On the other hand, in colleges, for example, the student may take one or two courses in statistics, history, or economics and subsequently have little contact with the subject matter of those courses. The loss is greatest when the materials of a course do not come again within the student's experience.

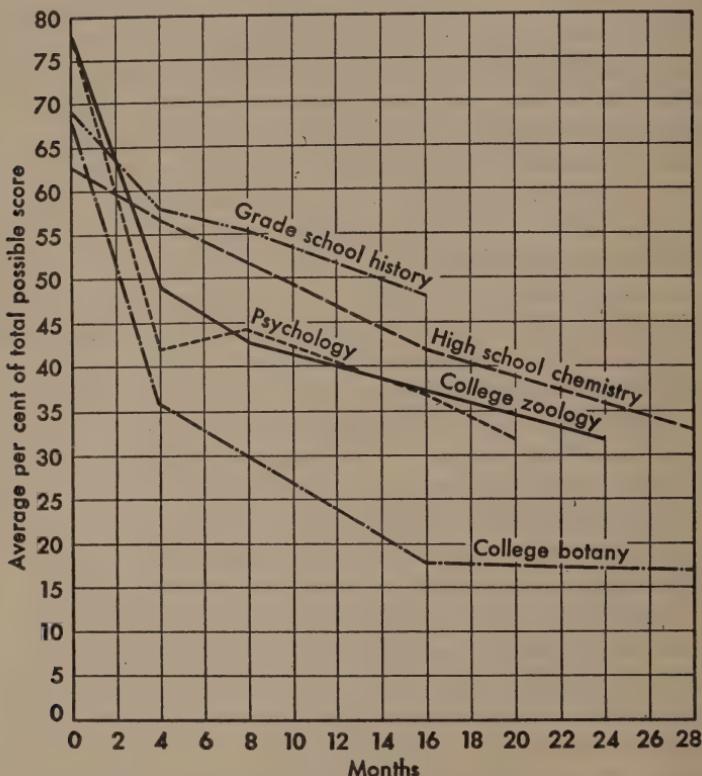


FIG. 19. Retention of one elementary-school subject, one high-school subject, and three college subjects for 16 to 28 months after the end of the course. (After Bassett, Greene, Powers, and Johnson. Reprinted by permission from S. L. Pressey, *Psychology and the New Education*, Harper & Brothers.)

Another reason why the loss of learning is less for grade-school children than for older persons is the rapid mental growth and development of children. This development is sharply upward for grade-school children, especially those in the lower and intermediate grades. In high school, this curve of development is reaching a plateau; in college and during adulthood, mere increase in age brings no increase in mental power because of growth. But during the grade-school and, to some extent, the high-school years the strengthening mental power retards the course of forgetting.

**FACTORS AND CONDITIONS THAT INFLUENCE LEARNING
AND THE AMOUNT OF RETENTION**

There are several factors that influence the amount forgotten and, conversely, the amount retained. Some of these factors, or conditions, are as follows:

- Experience following learning and effect on retention.
- The capacity of the learner, the amount learned, and retention.
- Summer vacation and forgetting.
- Nature of material learned and retention.
- The recitation and retention.
- Meaningfulness and retention.
- Thorough mastery, overlearning.
- Review and practice for retention.

Experience Following Learning and Effect on Retention. The learner's experience following the period of studying and learning influences retention or forgetting. Some experiences stimulate forgetting. A period of sleep tends to retard it, whereas periods of other activities, such as the active study of other lessons, result in less retention. Probably the common opinion that the best time to study is early in the morning is not entirely sound. The time before bedtime may possibly be the best for study, for few stimuli play on the mind during sleep to demand attention and crowd out the material learned. This point may not be significant except to emphasize the desirability of fixing the material learned before other material has a chance to cause confusion or usurp the attention unduly.

Some experiences following a given learning increase the amount learned, while others cause a loss. In a study made of the retention of algebra it was discovered that after a year there was about a 19 per cent loss in fundamental operations but in problem-solving ability there was an increase of 10.5 per cent. The fact that all the students in the experiment had been taking geometry the year following their having studied algebra accounts in no small part for the small decline in ability to do the fundamental operations and the increase in ability to solve problems. The training in geometry utilized the abilities that had been acquired in algebra the year before.

Other experiments have indicated that new learning following immediately after another type of learning has the greatest effect in tending to erase what has been learned. This new learning hastens forgetting, especially if the material learned is not neutral, so to speak, that is, if it requires the same kind of attention that the first learning

required. For example, if singing songs or physical education activities such as games followed a lesson in history, then there probably would not be so much loss in history as if the lesson in history were followed by a lesson in arithmetic.

Obviously, the school program cannot be organized so that there will be no inhibitive or negative effects on what has just been learned. Education must continue throughout the day, and the students and teachers turn from one subject to another. But there is one habit that teacher and students can develop to prevent forgetting, and that is to have some review and recall of a lesson as soon as possible. It is the early review of a lesson or the being tested on it that is most effective in preventing forgetting.

The effect on retention by experiences following the learning is technically called retroactive inhibition. This term *retroactive inhibition* is a formidable one, certainly, but one that a student of psychology and education should know. The word *retroactive* refers to acting back upon and *inhibition* indicates that the action tends to inhibit or retard learning.

The Capacity of the Learner, the Amount Learned, and Retention. Some learners have more capacity than others and consequently learn more. Forgetting is less rapid for those who have learned most, and the causes for this are several. Those who have learned most are the most capable; they understood better what they learned and therefore learned it more thoroughly. Having a firmer hold on what they have acquired, they retain it better.

In addition, the more capable are more expansive in their interests and intellectual activities. They study more widely. Consequently, they learn much that is interrelated, and this wider learning tends to retard forgetting of what is learned. This applies to the usual facts, ideas, principles, and generalizations that constitute a person's education.

Summer Vacation and Forgetting. Some educators regard the usual summer vacation of about 3 months as detrimental in that children lose so much information and skill during that period. It is true that children lose some abilities during the summer vacation and that it may take 2 to 15 weeks to regain the educational status which they had when vacation began. For most children, however, it takes only a short time to regain the summer-vacation losses.

Not all abilities show a loss, moreover. Reading ability and reasoning power are maintained through the vacation period, though more formal abilities, such as a knowledge of specific facts in history, geography, and arithmetic decline. Thus, the ability to reason effectively

in arithmetic does not decrease; the knowledge of tables and combinations does decline, however. The reading and general activity of students maintain their reading and reasoning ability, but the more specific and formal abilities decline because they are not practiced.

In connection with forgetting or loss of knowledge through disuse, studies have been made of the losses by children over the summer vacation. Some investigators who have studied this problem have discovered considerable loss and have been disturbed by what they consider a canceling of part of the gains made during the school year preceding the vacation. They determined the effect of vacation on the store of the pupils' knowledge by testing them before and after the summer, calculating the differences in achievement.

Not all studies of this question, however, have revealed a loss over the vacation. One made of eighth- and ninth-grade pupils shows that minor gains were made in vocabulary, language ability, history, civics, geography, and literature, and that the only loss of any considerable amount was in arithmetical computation, or the more mechanical phases of arithmetic.

There is no cause for worry if a loss in ability occurs over the vacation period, for it is only temporary in nature. When children resume school in the fall, they are older by the length of the vacation—usually by about 3 months—and in many instances have had useful out-of-school experiences. They soon regain their vacation losses, if any, and proceed with greater facility to new ground. Possibly an absence from work is desirable, for pupils are maturer and fresh when they resume their work.

A group of seventh-grade pupils was taught for a semester ending in June and then tested on its ability with general-science subject matter. It was retested in September following the summer vacation. Two tests were given every 2 weeks during the semester, one of which was used to test the acquisition of new material and the other to test retention of the old. Three different types of test were used: one to test the amount of factual information acquired, the second to test the ability to explain scientific phenomena, and the third to test the ability to draw conclusions from given data. The test used to measure the acquisition of facts and information was of the completion type. That used to measure the ability to explain scientific phenomena "consisted of a statement followed by five plausible explanations, only one of which was correct." And the test designed to test the ability to draw conclusions from given data "consisted of a statement followed by five plausible conclusions, only one of which was correct." A long

comprehensive test was given in June and again in September; comparison of the results in June with those in September following the vacation indicated an average loss of 14 per cent for all three types of tests in the field of general science. The loss of factual information was a little over 17 per cent, which was also the amount of loss in ability to draw conclusions from given data.

The loss of ability to explain scientific phenomena decreased only 9 per cent during the same vacation period. Apparently, the ability to explain scientific principles is lost to a lesser extent than one's knowledge of facts and information. It is a little surprising that the same statement does not apply to the ability to draw conclusions, for ordinarily this should not decline so rapidly as knowledge of facts and information.

The loss over the vacation taken as a whole was less than usually found, probably because the subject matter was thoroughly learned. The procedure of giving two tests every 2 weeks to measure acquisition of new material and retention of old had resulted in thorough learning.

Analysis was made also of the loss according to mental ability. The losses were least for the group with the highest and greatest for the group with the least ability. Those who know most tend to retain most; those who know least, to retain least.

It must be recognized that a time will come at graduation or other time of leaving school when students will cease studying systematically and that abilities not exercised will decline. Such loss is inevitable, and it is hoped that the students have drawn sound conclusions and made wise generalizations on which to base their judgments. For instance, a person may have forgotten many of the details of his courses in physiology but may have arrived at certain conclusions about exercise and diet. In addition, he may have developed certain ideals and attitudes about the human organism that influence his mode of living or his point of view toward evolution. Even during their school career, students lose some knowledge of a course after they have taken the final examination in it and started new courses. Losses are certain to occur through disuse, but there are certain residual gains in the forms of attitudes, conclusions, and generalizations that last much longer.

Nature of Material Learned and Retention. Some phases of learning are probably remembered better than others. The retention of material studied has been tested after a year has elapsed to find out whether or not there is differential retention. The examination was devised to measure the ability to select from a list of true and untrue statements

pertaining to chemistry those which were untrue; the ability to indicate facts and principles of chemistry that correctly apply to the solution of problems; a knowledge of terminology, such as definitions and descriptions of chemical terms; a knowledge of symbols, formulas, and valence; and the ability to balance equations.

To test the amount of retention, the students were examined a year after the completion of the course. Table 15 indicates the percentage of retention in terms of the gain made from the beginning to the end of the school year. For example, the girls retained 64 per cent

TABLE 15. RETENTION IN PERCENTAGE OF GAIN MADE DURING THE COURSE*

	Girls	Boys	Both
Selection of facts.....	64	93	84
Application of principles.....	93	91	92
Terminology.....	46	75	66
Symbols, formulas, and valence.....	65	73	70
Balancing equations.....	76	70	72
Total.....	67	87	81

* Adapted from Fruthey, 1937.

of the gain that they had made in the selection of facts during their year of chemistry; the boys, 70 per cent of their ability to balance equations.

Least was retained of terminology, or the ability to identify chemical terms, as it was measured, and most of the application of principles. These facts are important, for they indicate that the power to use and apply knowledge is lost less rapidly than the knowledge of terms. Therefore, the teacher should not limit his teaching to drilling on bare facts and principles but should enrich them by relating them to live situations. Sex differences occur also in the percentage of gain retained, but the largest differences evident in Table 15 are probably accentuated by certain accidental factors and probably do not represent the true differences. Generally, sex differences are not so large as these.

The Recitation and Retention. A pupil may spend all his study time studying, or he may spend part of it recalling and reciting what he has read. Least is retained if the former method is used; both immediate and remote memory are improved by recalling and reciting. One-half to even over three-fourths of the time apportioned to a lesson can be used with profit in recalling or reciting the content of the lesson.

The recitation can be made very effective not only as a means of setting forth and explaining the material to be remembered but also

for developing in students the mind-set for trying to acquire during the recitation the contents of the lesson. In addition, some of the principles of the recitation can be applied in supervised study and also in individual study by training the students to recite to themselves or by systematically trying to recall the contents of the lesson. This process requires

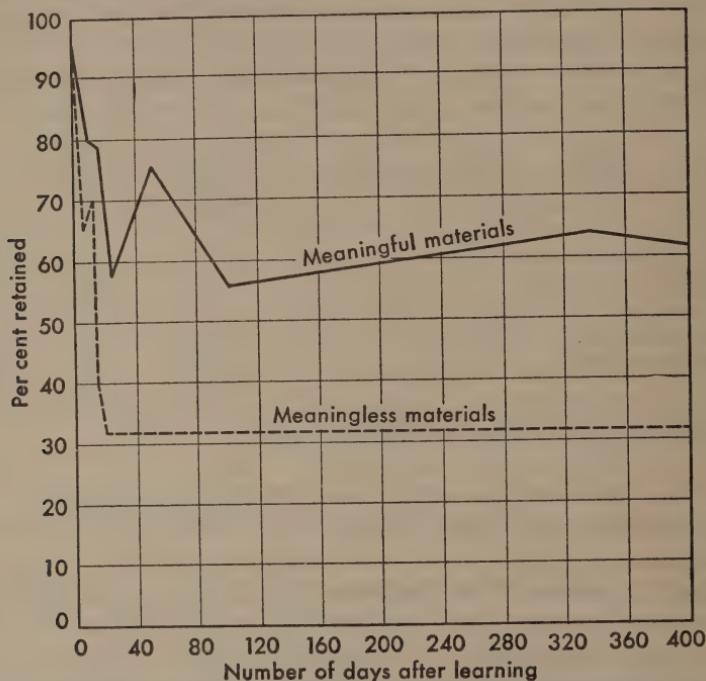


FIG. 20. The retention of meaningless and meaningful material as measured by the recall method. The curve for meaningless material is based upon 18 studies and that for meaningful material is based upon 24 studies. (From Robert A. Davis and C. C. Moore, *Methods of Measuring Retention*, *Journal of General Psychology*, 1935.)

active attention and the will to learn, which are often absent when the lesson is merely being read. These points are discussed at greater length in the chapter on "Being an Effective Student."

It has already been pointed out how retention in algebra differs, there being a small loss in ability to perform the fundamental operations and a small gain in the ability to work problems.

Furthermore, difficult material is forgotten more rapidly than is easy material. This is largely caused by the condition that easy material is learned more thoroughly and is better understood while the difficult material has not been grasped so firmly.

Meaningfulness and Retention. Many experiments have been con-

ducted on the retention of meaningful and meaningless material. The results indicate that meaningless material, such as nonsense syllables, is forgotten much more readily than meaningful material. The retention of nonsense material depends on sheer memory, whereas the retention of meaningful material is helped by associations. Facts related to known facts, words arranged in poems, and ideas suggested by others are remembered longer than isolated facts, words, and ideas. In Figure 20, the retention of meaningful material and that of meaningless material are compared.

Thus, in teaching, it is essential to help the students understand so clearly and fully that forgetting will be retarded. When the pupil says, "The teacher made it so clear and vivid when I learned it that I can hardly forget it," he is psychologically correct. Vividness in learning is the first requisite for effective retention, and obviously something must first be learned before it can be retained.

In this connection, it may be mentioned that intent to learn and to remember determines to a considerable extent the amount achieved. If the attention is passive and the repetition perfunctory and there is little or no intent to remember, little learning and retention are achieved. Interest and mind-set are necessary for retention.

The present educational organization with its many required courses, which are completed by an examination at the end, develops in pupils not an intent to remember but even a mind-set to forget. Students feel relieved that a course is over and make little or no effort to retain what they have learned. Consequently, forgetting goes on at a fast pace, with no attempt by the student to prevent it.

Thorough Mastery, Overlearning. One of the best ways to prevent forgetting is to learn thoroughly. That which is barely learned is rapidly forgotten. When a pupil learns a poem so that he is just able to repeat it without error; if he has learned his lesson hurriedly and can set forth some, but not all, of the facts; if he can type without error sometimes, if unusually careful; and if he can barely play a piece on the piano correctly, this material on which the hold is weak will be quickly forgotten. The learning should be carried beyond this stage, so that the facts, information, and ideas are thoroughly understood and firmly retained. Just as one drives a stake deep so that it is firm, ties a rope with an extra knot, drives in an extra nail, and, in general, exercises extra care to prevent loosening, so, to prevent forgetting, the learner should study and review the material until it is firmly and thoroughly acquired.

Overlearning is a term applied to learning beyond the stage where

the material can be said to have been learned. If a child has learned the arithmetic tables so that he can give the answers without error, he may be said to have learned them. Continued study of them may then be described as overlearning the combinations. Up to a certain extent, time spent in overlearning, in fixing the material learned, is profitably used. If, for example, an hour is needed to learn a number of foreign words, a poem, or some essential facts, up to a half hour, or up to 50 per cent more time, can profitably be used to overlearn them. The forgetting prevented by more thorough learning is of such an amount that it pays to spend time studying a topic after it has been barely learned. There is obvious value in having a firm grasp of a subject rather than a faint hold, even if the latter were not so easily lost.

Review and Practice for Retention. Forgetting some facts, names, places, and events cannot be avoided. There is no possible way to retain all that we have learned. People differ widely in their power to retain as well as to learn; but no matter how retentive they may be, human beings are able to recall only a small portion of all that they have learned since birth. Knowledge that has been acquired but is seldom used or rarely brought to the attention may be forgotten, but it can be revived when needed, and generally relearning will take less time than the original learning. For the most part, we retain that which we need and have practiced most or that which has been vividly impressed on our memory by certain associations or by emotionalized situations.

There is some information, such as arithmetic combinations, various poems, words, technical terms, languages, and outstanding historical events, that one wishes to retain. After acquisition and understanding, reviews and drills may be spaced to decrease forgetting. An important principle to observe is that the first period of review or practice following the learning should come after only a short lapse of time. If new words of a foreign language have been learned, they will be lost if a long period elapses before the review. If they are reviewed within a short time, say the next day, forgetting will be checked. The time interval between succeeding practices can be increased progressively. Thus, if the first interval is 1 day, the next one might be 2, the following one 4 days, then 8, 16, 32 and so on. A distribution approximating geometrical progression or doubling the previous interval is a fairly satisfactory one. If the interval is too long, the learner will find that forgetting has set in to such an extent that considerable practice is required to relearn. The intervals should be of such length as to reduce to a minimum the necessity for relearning. In general, intervals of increasing length are more conducive to economical relearning. One hundred

minutes of review carefully apportioned will prevent more forgetting than 100 minutes used as a single period or distributed unsystematically after long periods of no practice.

In addition to the formal and systematic aspect of learning and forgetting, there is a more indirect and informal method of facilitating the process of learning and retention. To illustrate, consider the case of the pupil who learns words formally. He increases his vocabulary by learning the meanings of a list of words by rote. When he can define all the words without an error, he reviews them systematically to prevent forgetting their meaning.

Such practice and review are effective, but this should not cause us to overlook the learning that is more incidental in its character. The extent of a person's vocabulary can also be increased without planned drill and review. Most of the learning of words by both children and adults is done informally or incidentally. Words are learned by hearing them in speech and by reading them in papers, magazines, and books. The meanings of new words are studied in the dictionary or are defined by someone who knows the definitions. Because the words are used in spoken or written sentences along with other words, their meanings are fitted into a particular context. Associations are made, and the meanings become functional. The most effective method of acquiring words and retaining their meaning is to read widely so that the words are experienced in various uses. It may also be added that discussion, debating, writing, and reciting stimulate the acquisition of word meanings.

The same concepts apply in other fields. Pupils can, on the one hand, learn the principles of composition by memorizing rules whose retention can be assured by systematic reviews, for a time at least. A more psychological approach, however, consists in causing pupils to write compositions and letters that grow out of projects and that are thus motivated. The teacher can then utilize the principles of composition to explain their strength or weakness and to suggest improvement. Thus, the principles are learned in connection with actual writing. Having been learned by exercise and practice rather than by rote, they can be more readily retained and recalled.

Continued and systematic review of materials that have been learned is not a practical way to prevent forgetting the vast amount that we learn from year to year. That procedure is impossible, for we should soon reach a point where we would have to devote all our time to reviewing old material and none to expanding our knowledge and skills. Sustained study in various fields will usually suffice to maintain old

proficiencies and abilities and will develop new ones. Because of interrelationship in knowledge, much that has been formerly learned will often be incidentally reviewed and reinterpreted.

However, it must be recognized that a time is reached when the amount forgotten is about equivalent to the amount acquired. Such a point of equilibrium represents the limit of development through learning.

SUMMARY AND REVIEW

We forget much that we learn, and the degrees of forgetting vary from a complete loss to no forgetting whatever. Forgetting is most rapid immediately following learning and slows down in its rate with the passing of time. Apparently, forgetting is most rapid in college, next in high school, and least in the grades.

Activity following a period of learning tends to hasten forgetting of what has been learned, and this acting back on what has been learned is called *retroactive inhibition*. There probably is least forgetting when sleep follows a period of learning.

The ablest student learns most and retains most. A reason for this is that he understands better what he learns than does the less able student.

Forgetting usually takes place during school vacation and is largest in the case of facts, but a general ability like reading increases. Whatever is forgotten is soon regained in the fall.

Principles and the ability to use or apply ideas are retained better than bare facts.

In trying to learn thoroughly and in the attempt to retain as much as possible the learner should recall what he has studied and should recite either silently or orally. The class recitation can be made very effective in preventing forgetting.

Some materials are much more meaningful than others (abstract material learned largely by rote, for example). Meaningful material is retained much better.

If a student wishes to retain what he learns, he must first learn very thoroughly. Learning by extra practice beyond the point of bare learning is called *overlearning*. It is very profitable to spend extra time in learning very thoroughly.

The first review should take place shortly after the learning, say within a day or two, and thereafter at increasingly longer intervals. The reviews should be intensive, but during the reviews the student should look for new ideas and interpretations.

Test Your Thinking

1. We forget much of what we learn and retain comparatively little. These experiences can possibly be compared with mining a great deal of ore for the metal obtained. Comment.
2. Show how experiences following learning of some material can expand that learning or cause a loss of learning.
3. Studying before going to sleep may be a good practice. Comment.
4. There was a song to the effect that the more one learns the more one forgets, and after the manipulation of words it was concluded that it does not pay to learn. What are the psychological facts about the capacity of the learner, amount learned, and retention?
5. Explain whether or not we remember some kinds of materials better than others.
6. What are the effects of summer vacation on forgetting what the school tries to teach the pupils?
7. By the term *recitation* we refer to recalling the material, reciting it, and discussing and going over it. Discuss the effect of recitation on retention.
8. A good teacher explains carefully so that the pupils understand what they learn. She imparts meaning to the materials that are studied. Does this kind of teaching improve learning and retard forgetting? Explain your answer.
9. What is the relation between thorough learning and retention?
10. If a student can "get by" with 18 hours of studying per week, why should he study 25 hours per week?
11. When a student has learned something that he wants to retain, when should he return to it and study it again?
12. What are the principles of effective review?

References

- ANSBACHER, H. L.: On the Permanence of College Learning, *Journal of Educational Psychology*, 31: 622-624, 1940.
- BASSETT, S. J.: Retention of History in Sixth, Seventh, and Eighth Grades with Special Reference to the Factors that Influence Retention, *Johns Hopkins University Studies in Education*, 1928.
- BRIGGS, L. J., and H. B. REED: The Curve of Retention for Substance Material, *Journal of Experimental Psychology*, 32: 513-517, 1943.
- BUMSTEAD, A. P.: Distribution of Effort in Memorizing Prose and Poetry, *American Journal of Psychology*, 53: 423-427, 1940.
- BUMSTEAD, A. P.: Finding the Best Method for Memorizing, *Journal of Educational Psychology*, 34: 110-114, 1943.
- DAVIS, ROBERT A., and C. C. MOORE: Methods of Measuring Retention, *Journal of General Psychology*, 12: 144-155, 1935.
- DIETZE, A. G., and G. E. JONES: Factual Memory of Secondary School Pupils for a Short Article Which They Read a Single Time, *Journal of Educational Psychology*, 22: 586-598, 667-676, 1931.

- DIETZE, A. G.: The Relation of Several Factors to Factual Memory, *Journal of Applied Psychology*, 15: 363-374, 1931.
- ENGLISH, H. B., E. L. WELBORN, and C. D. KILLIAN: Studies in Substance Memorization, *Journal of General Psychology*, 11: 233-259, 1934.
- GREENE, E. B.: The Retention of Information Learned in College Courses, *Journal of Educational Research*, 24: 262-273, 1931.
- HOULAHAN, F. J.: Immediacy of Interpolation and Amount of Inhibition, *Journal of Educational Psychology*, 32: 37-44, 1941.
- JOHNSON, L. M.: The Relative Effect of a Time Interval upon Learning and Retention, *Journal of Experimental Psychology*, 24: 169-179, 1939.
- JOHNSON, P. O.: The Permanence of Learning in Elementary Botany, *Journal of Educational Psychology*, 21: 37-47, 1930.
- LAHEY, SISTER M. FLORENCE LOUISE: Permanence of Retention of First Year Algebra, *Journal of Educational Psychology*, 32: 401-413, 1941.
- LEAVITT, H. J.: The Relation of Speed of Learning to Amount Retained and to Reminiscence, *Journal of Experimental Psychology*, 35: 134-140, 1945.
- NEWMAN, E. B.: Forgetting of Meaningful Material during Sleep and Waking, *American Journal of Psychology*, 52: 65-71, 1939.
- O'KELLY, L. I., and L. C. STECKLE: The Forgetting of Pleasant and Unpleasant Experiences, *American Journal of Psychology*, 53: 432-434, 1940.
- PETERSON, H. A.: Recitation or Recall as a Factor in the Learning of Long Prose Selections, *Journal of Educational Psychology*, 35: 220-228, 1944.
- REED, H. B.: Meaning as a Factor in Learning, *Journal of Educational Psychology*, 29: 419-430, 1938.
- SCHREPEL, MARIE, and H. R. LASLETT: On the Loss of Knowledge by Junior High School Pupils over the Summer Vacation, *Journal of Educational Psychology*, 27: 299-302, 1936.
- SMITH, H. L., and M. T. EATON: The Relation of Retention to Speed of Learning, *Bulletin of the School of Education of Indiana University*, 15 (No. 3), p. 105, 1939.
- SONES, A. M., and J. B. STRAND: Review with Special Reference to Temporal Position, *Journal of Educational Psychology*, 31: 665-676, 1940.
- SPENCER, E. M.: The Retention of Orally Presented Materials, *Journal of Educational Psychology*, 32: 641-655, 1941.
- SPITZER, HERBERT F.: Studies in Retention, *Journal of Educational Psychology*, 30: 641-656, 1939.
- WEBER, C. O.: The Acquisition and Retention of Reading Skills by College Freshmen, *Journal of Educational Psychology*, 30: 453-460, 1939.
- WELBORN, E. L., and H. ENGLISH: Logical Learning and Retention: A General Review of Experiments with Meaningful Verbal Materials, *Psychological Bulletin*, 34: 1-19, 1937.
- WORD, A. H., and R. A. DAVIS: Acquisition and Retention of Factual Information in Seventh Grade General Science during a Semester of Eighteen Weeks, *Journal of Educational Psychology*, 30: 116-125, 1939.
- WORD, A. H., and R. A. DAVIS: Individual Differences in Retention of General Science Subject Matter in Case of Three Measurable Teaching Objectives, *Journal of Experimental Education*, 7: 24-30, 1938.

CHAPTER XVII

TRANSFER OF LEARNING AND MENTAL DISCIPLINE

What to Look For. Learn the meanings of the terms *transfer* and *mental discipline*.

Observe situations to which training and transfer are attributed when in fact only selection has taken place.

Note that the curriculum has changed greatly and that transfer and discipline are depended upon very little, whereas formerly, with a limited curriculum, they governed much of educational practice.

In the case of the former engineering school that is described, differentiate between discipline, transfer, and selection. What is the difference in the educational theory of this school as it is today and as it was yesterday?

Understand and be able to apply the theory of generalization and identical elements.

Some experiments on transfer are described. Be sure you understand the methods of the examination and the results.

Transfer varies according to the mental ability of pupils, and the reader should understand this differential transfer.

Some experimental results are given on the transfer effects of individual school subjects, and these results should be understood.

How can languages be taught most effectively? Specifically, how can Latin be made most valuable?

A table is given that summarizes the results of experiments on transfer. These results should be understood.

What kind of school curriculum should we have in terms of what we know about transfer? How should the teacher teach in order to obtain a maximum amount of transfer?

Even though mental discipline and transfer are no longer dominant educational objectives, what should the teacher do in order to train her pupils most effectively?

Introduction. The disciplinary value of the study of logic was advocated for prelaw students by the president of an important university. He stated that, according to his observations, law students who had had courses in logic were superior students, and he attributed this superiority to the disciplinary value of training in logic. He overlooked

the fact that superior students elected to study logic and probably would have made equally good law students without the course.

It is also assumed, according to the theory of mental discipline, that the powers of discrimination, perseverance, analysis, and observation developed in one situation function in another, in other words, that powers developed are transferred from one situation to another. A professor of law had that point in mind, too, when he indicated that he preferred, not students who had studied sociology, political science, and economics, but those who had taken a considerable number of courses in mathematics. "They can think more clearly," he said, "and can solve the legal problems that confront a law student." This professor did not say that the knowledge acquired in mathematics helped in law but implied that the training, or mental discipline, obtained from the study of mathematics functioned in the study of law. Again, the selective factor was overlooked. Students who select mathematics courses and finish a number of them are likely to have the mental qualities that enable them to succeed not only in law subjects but in medicine, chemistry, psychology, and other fields as well.

What Is Learning through Transfer? A person learns through transfer to the extent that the abilities acquired in one situation help in another. Thus, there is transfer from Latin to English to the extent that a student is better in English than he would be if he had had no Latin. There is also transfer from grammar to composition to the degree that the study of grammar enables a child to express himself better than he would have been able to do had he not studied it.

Mental discipline refers to the training of the mental powers. According to this concept a subject has disciplinary value if its study trains one in observing accurately, thinking logically, developing powers of attention, and acquiring general mental power. According to such a theory the study of geometry is believed to train the mind to attack problems logically, the study of Latin to develop mental stamina, and the study of grammar to increase reasoning power.

One learns by transfer when that which is acquired in one situation also appears in another. Thus, Latin helps one to understand English words to the extent that Latin elements occur in the English language. If Latin had no relation to English, then no transfer would exist on this basis, which has been described as *transfer according to identical elements*. Accordingly, the most transfer occurs from one situation to another in which there are most identical elements and the least where the amount in common is least.

The gain from one situation to another on the basis of mental

discipline corresponds to the extent to which the qualities and characteristics acquired in one situation manifest themselves in another. In some instances, there is little transfer. A scholar, for instance, who has a judicial temperament in his own field of study may not have the same qualities of mind when he is selecting his candidates during the heat of a political campaign. In such a situation the mental discipline of one situation does not carry over to another. If a pupil works very systematically and rigorously on reading, history, and arithmetic but is inattentive and careless when cooking, sewing, and writing, there is no transfer of mental qualities or training from the one type of situation to the other.

The Curriculum. In the nineteenth and the early twentieth century the doctrines of transfer and of mental discipline were commonly accepted by teachers and other educators. Even in this day of modern education the distinguished chancellor of the University of Chicago, Robert M. Hutchins, maintains that the major function of a university is to discipline the mind—train the students to think—and he recommends the systematic study of Latin and Greek for accomplishing this purpose.

When educators subscribed to the theories of transfer of training and mental discipline, comparatively few subjects were included in the curriculum. It was necessary to have only a few carefully selected subjects the content of which had disciplinary value which would transfer to other situations. According to this point of view, many utilitarian subjects are not needed, for training in a few would give one the mental qualities that enable him to be effective in all situations.

The principle of learning through transfer of content learned in one situation to another and the functioning in all situations of mental qualities developed in a given situation so dominated the teachers of the nineteenth century that they accepted the utilitarian subjects of home economics and manual training, not for their utilitarian values, but for the training and disciplinary values which they were assumed to have. Mechanical drawing, for example, was accepted in the curriculum by its teachers, not for its vocational value, but because pupils would be trained in perception, would learn to visualize, and would develop a sense of proportion.

Now, however, the principle of transfer and discipline does not control the school curriculum. Subjects are included primarily because of their value in terms of social and practical standards. Skills and abilities are taught directly, for we no longer believe that we can learn indirectly by transfer. Educators and psychologists realize that the

circumstances of life call for many specific functions which must be learned and that a general training is not sufficient. Consequently, we have many subjects in our curriculum. Another important factor that accounts for the large number of different subjects in our curriculum is our knowledge of individual differences in abilities and interests, and we attempt to adjust subject matter and teaching to those abilities and interests.

A School Based on Discipline and Transfer. We may describe in this connection an engineering school that operated on the principle that a thorough general training would enable its graduates to apply themselves successfully to specific technical problems. The students enrolled for the 5-year course were required to take almost the same courses as the students in the liberal arts, or the science, letters, and arts, college. They majored in mathematics, physics, and chemistry, but they also did considerable work in English, speech, economics, political science, and the languages.

These engineering students, of course, had some technical training also, such as mechanical drawing, surveying, and machine design. Compared with other engineering schools, however, the students received relatively little training of a purely technical nature—only enough to give them a general orientation to engineering problems and practices.

The guiding principle of the faculty of this engineering college was one of training and discipline. They maintained that, if their students were given a broad training in mathematics, physics, and other academic subjects that underlie engineering and, in addition, were trained in the bare essentials of engineering, they would be able to generalize their training and apply it to the larger engineering problems. They claimed that their students would become more than technicians, who do the elementary work in engineering, such as mechanical drawing, and that they would quickly develop into consultants and executives. Their general point of view was that a broad general training in the fundamentals rather than detailed and specific training in the techniques imparted a quality of mind suited to functioning on a higher level.

An investigation of the graduates of this school seemed to substantiate the position taken by the faculty. They held good positions as executives and consultants. Their employment history indicated that they had spent only a year or two at apprenticeship work and that they soon acquired positions where they exercised initiative and control. These facts appear to support the point of view that good fundamental

education can be generalized and applied specifically and effectively to problems at a higher level.

Another fact was discovered, however, that implied that the ability and success of graduates of the 5-year course of this engineering school could not be uncontestedly attributed to the type and quality of education that they had received. The fact is that, of those who enrolled as freshmen in this college of engineering, only 5 per cent finished the 5-year course of study. Thus, the graduates were selected for high capacity and achievement. Only the best students survived to graduate. Consequently, they were the type who would be likely to succeed whether their training was general or highly technical and specialized.

In discussing this high degree of selection it was pointed out that, if the requirements for graduation included 5 years' study of the Chinese language, even better engineers would be graduated. Obviously, the extensive study of the Chinese language would not equip a student to become a better engineer, but the number of students who could and would get over that hurdle would be even smaller and thus still more highly selected. In other words, the survivors of such a rigid requirement would be the hardest workers and the most intelligent. They would be likely, therefore, to become high-grade engineers.

It might be of interest to add at this point the fact that the engineering school has been greatly expanded and now has a tremendous physical plant equipped with much machinery and technical apparatus. Engineering is now learned through direct application. In other words, a student learns about a machine by working on the machine.

The Theory of Generalization. According to this theory, experiences, knowledge, and habits gained in one situation help us to the extent that they can be generalized and applied to another situation. In the engineering school just described the faculty assumed that the students acquired methods of attacking problems and a body of knowledge and principles that they could apply to specific problems. Accordingly, a teacher who has learned the psychology of child behavior, the principles of learning, and the psychology of differences in capacity should be able to apply this knowledge to the classroom situation and teach successfully.

We may illustrate specifically with the following facts: A person learns in his science class that sound travels about 1,092 feet per second and that light travels about 186,000 miles per second. Can a person possessing these facts explain when he sees a distant hunter shoot his gun why he hears the report of the gun a short while after he sees the

smoke? One who can apply his facts will be able to set forth the explanation that, because of the high speed of light, he sees the smoke almost immediately when it comes from the mouth of the barrel but that the report is heard later because sound travels much more slowly than light and therefore reaches the ear an instant later.

In geography, certain principles are taught involving winds, bodies of water, mountains, latitudes, etc., so that children will apply this knowledge in predicting the characteristics of a region and its industries. Certain facts and information are generalized into principles that can be used to solve and explain various problems. Thus, if children learn to generalize a body of geographical facts into principles, they can learn to use these principles in solving other problems in geography. A child soon learns the relationship between temperature and plant life and learns to make deductions on the basis of that knowledge.

In psychology, for example, we are taught that, of the basic urges of human beings, two important ones are the desire for security and the need for a feeling of personal worth. A careful observer can explain much of human behavior in terms of these wants and urges, and in dealing effectively with others an appeal to these drives and desires is usually successful. The student wants to succeed in school in order to feel secure and also to feel worthy. The good salesman says that the automobile he is selling is safe and that possessing it will give the owner prestige. It is possible to apply the knowledge about human urges in many situations.

We have no exact information on how much is learned by generalizing knowledge, applying it to many situations. We do know that most of our inventions are arrived at in this way. The scientist, for example, experiments, collects data, and makes a discovery or evolves laws and principles. If wide application is made of the discoveries or principles, we say that they are generalized. The electromagnet, for instance, is a discovery that has been applied extensively. Its principles are found at the basis of hundreds of devices—telegraph instruments, electric motors, and the simple electric bell.

The ability of individuals to generalize knowledge varies with the degree of their intelligence. The most intelligent can generalize their knowledge in more situations and in more complicated ones than can the less intelligent. Those of low intelligence can hardly do so at all. The power of generalization is greatest for those who can summarize their knowledge in words, figures, musical notes, and other symbols. The poet, artist, musician, and engineer have generalized in these terms.

The abstract element is very important; consequently, one's ability

to generalize is a good index to the degree of his intelligence. Teachers should work for wide application of the facts, theories, and principles discussed in the classroom. The teacher who has a faculty of drawing her examples from many fields makes her pupils conscious of the interrelationships of facts and principles and their wide application. The history teacher, for example, in discussing the struggle over taxes during the pre-Revolutionary and Revolutionary periods, should aim at developing certain principles but might stop a moment and call the attention of the students to the tax problems confronting local, state, and Federal governments today. Pupils and teachers might discover that the history of the tax issues of the eighteenth century would help them to understand present tax problems. They might generalize even further by studying some of the problems in other countries, also.

When a teacher in general science or physics teaches the interrelationships of pressure and temperature in their effect on gases and requests that students memorize Charles's law, he might raise questions about the inflation of automobile tires in hot weather, ventilation, the combustion of gases in various types of engine, and the relationship of air pressure and weather.

The teacher of psychology might teach the conditioned salivary reflex by explaining clearly how a dog learned to salivate in response to the sound of a bell because this had been rung when the dog was given food. The following illustrates the principle of the conditioned reflex:

S_1 (food)	R_1 (salivation)
S_2 (sound of bell)	R_2 (hearing or listening)
S_1S_2 (food and bell together)	R_1 (salivation and listening to bell)
S_2 (sound of bell)	R_1 (salivation)

Food stimulates salivation, but the sound of a bell alone does not. When the sound as a stimulus is associated a number of times with the food stimulus, the sound of the bell alone will cause the salivary response.

A teacher should point out the application of this principle to the problem of changing or conditioning the behavior of people. He can show how we learn to be conditioned for or against certain things because they are associated. We learn to choose a certain soap because it is associated in the advertisements with certain people of prestige; we dislike people with a certain type of face because, at some time, a person with such a face offended us; and we avoid certain topics of discussion or certain fields of study because the associated experiences

have been unhappy ones. The pain and pleasure or satisfaction and dissatisfaction that have been associated with so many of our experiences determine to a considerable extent our behavior. The teacher should not only make application of the principle of the associated response by many examples and illustrations but should also encourage students to generalize. Students ordinarily learn many facts and principles in rote fashion and may fail to transfer their knowledge to another situation unless the instructor trains them to see its relationship to other problems.

Some Experiments on Transfer through Generalization. The theory of transfer through generalization was set forth about four decades ago by Judd, a distinguished psychologist and educator. In collaboration with Scholkow, Judd set up an experiment for testing the ability of boys to hit a target placed under water. Some of the boys had studied the refraction of light—how it takes a direction at a different angle when it leaves or enters a substance such as water, glass, or diamond. Others had not been given such instruction. We know that an oar in water does not seem straight and that a fish or other object is farther under the surface of the water than it seems. This is due to the fact that the light from an object under water refracts at a different angle when it leaves the surface and that when it strikes the eye the object appears closer to the surface than it actually is.

The purpose of the experiment was to determine whether or not boys who had studied the refraction of light could hit a target under water better than boys who had not. It was discovered that when the target was 1 foot below the surface of the water there was little difference in the abilities of the two groups but that when the target was raised to within 4 inches of the water's surface the boys who had been taught the principles of refraction were able to adjust better than the others.

Hitting a target 4 inches under water is considerably easier than hitting one 12 inches under. It is easier to estimate a "correction" for the smaller depth. In this instance, experience with the greater depth and a knowledge of light refraction enabled a quicker adjustment on the part of some of the boys. This superiority probably reflects their ability to generalize their knowledge and experience by applying it to a new situation.

Hendrickson and Schroeder repeated the essentials of the Judd-Scholkow experiment, with eighth-grade boys who shot with a BB gun at a bull's-eye type of target submerged in water at depths of 6 and 2 inches. Three groups of boys were used in the experiment. Group A was told about refraction, but without discussion. Group B was told

as much as Group A but was given extra explanation. The control group was given no information about refraction.

The results were essentially these:

1. Group B had the best score at the depth both of 6 and of 2 inches.
2. Group C had the poorest scores for both the 6- and the 2-inch depth.
3. The percentage of improvement also corresponded to the amount of instruction.

Instruction and explanation help people apply ideas and principles to specific situations. In other words, they are helped to make use of their knowledge. Consequently, whenever the teacher is teaching theory and principles, he should stop to give examples and make application to specific situations—in teaching history, to present problems; in teaching chemistry, physics, and biology, to the functioning of the human body and to everyday living. Geography, also, should be closely related to everyday living.

Interest always surrounds the question of the extent to which practice or training in one situation transfers and helps one in another. An experiment was worked out by Barlow with elementary-school pupils most of whom were seventh- and eighth-graders. The object was to discover how much the power to interpret Aesop's *Fables* was improved by special practice in reasoning and analysis. The subjects were tested both at the beginning and at the end of the experiment with a test consisting of 15 fables. One example was about a widow who doubled the amount fed to her hen, expecting two eggs a day, the best answer or interpretation being that "figures are not always facts."

The experimental group had four lessons on analogies (boy is to girl as man is to _____), four lessons on analysis and the practices of generalizing from particular to general and from general to particular, and four in analyzing behavior situations. In the lessons the pupils worked over the material by discussing and explaining how they arrived at their conclusions. The control group did not have this practice. Thus the difference in the ability to interpret the fables as measured by the comparison of the tests before and after training by the experimental or practice group indicates the extent to which lessons in reasoning by analogies, by induction (concrete to general), and by deduction (general to concrete) improved the ability to interpret fables.

The net gain for elementary pupils was 64 per cent. Of the seventh- and eighth-graders the upper half in intelligence gained 30 per cent more than the lower half. After a year's time the subjects were tested again, and it was discovered that much of the gain had been lost. However,

this experiment shows that training in methods of reasoning with some materials transfers and improves ability in reasoning with other materials. Possibly in this experiment we have a suggestion that methods of teaching that cause students to study effectively are important from this point of view.

Transfer as a consequence of practice in outlining and summarizing was obtained with seventh- to twelfth-grade pupils in an actual schoolroom situation. This study by Miss Salisbury was similar to that by Barlow, for the practice was in method and the transfer was a transfer, not in knowledge, but in a skill or method obtained by the experimental group through practice. In this study the experimental group was given 30 specially prepared lessons, which consisted of material to be outlined and summarized. The practice consisted in picking out the main points, arranging them in logical order, and observing the "next steps" in thought; some practice also was included in preparing outlines for the students' own original compositions. The control group was not given this practice, and consequently the differences in the abilities of the two groups could be attributed to the practice.

The transfer effects were measured by testing the abilities of the control and experimental groups with a test of general mental ability; a reading examination; a reasoning test; and an achievement test in American history, civics, and general science before and after the practice period. If any transfer has occurred, the practice in extracting the thought from printed material by careful outlining and summarizing should show itself in improvement in the mental, reading, reasoning, and achievement tests.

A comparison of the abilities of the two groups, one with and one without the special practice, indicated the extent to which the effects of the special practice in outlining and summarizing came into play in the abilities measured by the mental, reading, reasoning, and achievement tests. To expect improvement in the abilities measured by a general mental ability test is setting up a very high criterion for transfer, for it is most difficult to influence the scores on a test consisting of various exercises. It is not unexpected that practice in outlining and summarizing will be reflected in a reading test by means of which the ability to obtain the meaning from printed paragraphs is tested. To some degree, this ability may be expected to manifest itself also in reasoning and achievement tests.

The results indicate that an important carry-over occurred. The group with 30 specially prepared lessons showed improvement in all tests. The improvement in the mental ability test was not large enough

to be significant or attributable without doubt to the special practice. In the case of the reading test the difference was large enough to be attributable without doubt to the practice. A difference expressed by a critical ratio of 3 is necessary before there can be no doubt that the difference is significant and due not to chance but to the actual effects being measured. The increase in reading was expressed with critical ratios of 4.7 for the seventh grade and 6.6 for the twelfth grade. Even though the ability to obtain meaning from printed paragraphs increased, the speed of reading decreased. Such a decrease illustrates a negative transfer. The practice of studiously outlining a selection resulted in slower and more careful reading.

For the reasoning and achievement tests a carry-over in ability was also represented by differences large enough to be significant. The general results can be summarized by quoting from the study: "The mental skills involved in outlining and summarizing, described herein as the processes of logical organization, transfer to produce improvement in general thinking or reasoning ability, as tested by problems not related to the specific school curriculum."

The Theory of Identical Elements. According to the theory of identical elements, which has already been mentioned, there is transfer from one situation to another to the extent that there are elements in common in the two situations. For example, according to this theory the study of Latin helps one in English to the extent that there are Latin elements in English. There is transfer from algebra to geometry to the extent that parts, or elements, in geometry occur in algebra, some of these common elements being symbols, equations, and proportions. There is transfer from baseball to football to the extent that there are common elements, such as running, throwing, catching, and general body agility. Many of these elements are not exactly identical, but in general there is much in common.

There is more transfer from geography to history, and vice versa, than from geography to penmanship, and vice versa, for geography and history have more in common, or more identical elements, than geography and penmanship. This is obvious. There is more transfer from arithmetic to algebra than from art to algebra because of more identical elements, or commonness. There is more transfer from reading to spelling than from reading to playing baseball because of a greater number of common elements. In reading, one deals with letters and words the same as one does in spelling. The processes are far from being the same but there are common elements, which is not true of reading and playing baseball.

The teacher should look for common elements in situations and point them out. Common or identical elements will help explain transfer from one situation to another as well as the relationship between them. If the teacher will point out the identical elements, learning will be facilitated.

Comparison of the Theory of Identical Elements and Generalization. The two theories or principles commonly advanced to explain transfer of training are those of *identical elements* and of *generalization*. The principle of identical elements involves specificity and perception. The transfer depends on the extent to which specific elements exist common to each situation and the degree to which they are perceived. The principle of generalization, on the other hand, is conceptual in nature. Transfer depends on possessing a concept or idea and being able to apply it in another situation. In some respects, it may be difficult to distinguish the two theories. The theory of identical elements pertains to recognizing common elements in situations. Generalization is the application of principles and concepts to situations through perceiving their relationships.

Transfer According to Mental Ability. In connection with the wide differences in the capacity of students the question arises as to the relationship between transfer of training and mental capacity. Does amount of transfer correlate with capacity? In other words, is there a tendency for greater transfer in the case of brighter pupils and for less for the duller?

In general, the training values are greatest for those who are the brightest. The experiment by Barlow indicated this to be true. The abler learn more from a situation and can transfer more to another situation. Those who are poorer in one situation are relatively poorer in another. This was also shown in a study devised to test the effect of the study of science on the soundness or unsoundness of attitude toward life situations. In other words, an attempt was made to discover the extent to which a scientific attitude, rather than superstitions and biases, controlled one's thinking in different situations. It was discovered that some with considerable knowledge could not apply it to situations, probably because they acquired facts and principles mechanically and by memorizing the content of the book. Many pupils who do well in the tests have acquired their knowledge in this way. It was also discovered that those who apply their facts rationally are students of higher intelligence and have had greater experience in situations embracing the scientific facts involved. For example, the brighter boys who have had experience with electric irons, switches,

coils, batteries, and similar equipment can apply the facts and principles of electricity more effectively. In other words, the transfer is greatest for them. Furthermore, persons with knowledge and experience can distinguish sound and valid explanations from fallacious ones. Two points have been made: (1) Most transfer occurs for the bright. (2) Experience facilitates transfer.

Information about the comparative mental development of dull and bright, as a consequence of school training, was obtained from another experiment, which consisted in relating growth in mental tests to the subjects that the pupils studied in the ninth, tenth, and eleventh grades. The tests were given at the beginning of the experiment. The purpose of the experiment was to determine the extent to which the abilities measured by intelligence tests were affected by the subjects studied in high school. The courses taken by the students were compared. When they were similar except for two subjects, the training effect of these two subjects on general intelligence could be determined. Thus, if a group of children whose courses for the year were English, algebra, sociology, and Latin had the same initial ability and were similar in other important respects to another group who studied English, algebra, sociology, and economics, the differences in ability in the intelligence tests at the end of the school year could be attributed to the differences in the disciplinary and transfer effects of Latin and economics. The other three courses of the two groups were the same, and thus the only variables were the two subjects Latin and economics. For other groups of students, various other pairs of subjects were the differentiating ones. Groups were compared in this manner so that changes in ability could be attributed to the specific subjects.

In the present example, if the group studying economics scored higher in the end tests than the Latin group, then it may be implied that economics has greater disciplinary and transfer value than Latin, and vice versa. The other subjects studied by compared groups were evaluated in the same way, so that differences in mental ability could be attributed to the training effects of specific subjects.

The purpose of discussing this experiment at this time is to interpret the amount of disciplinary and transfer value according to the degree of brightness or dullness of the pupils themselves and not primarily to evaluate the effect of various high-school subjects on the development of general ability involving words, numbers, and symbol relationships. A quotation from Thorndike's study includes quantitative comparisons.

Let us now consider the results if we deliberately take the most favorable possibility for large differences between studies, by assuming that the gain from

the experience of the examination itself is a special practice effect which is due wholly to that experience and is just as great for one program as for another and has nothing to do with the ability of the mind to think, or is correlated with it negatively, so that 11.9 points should be subtracted from all these estimates. We then have as the effect of the different programs:

- 22½ for the three courses in science and one in mathematics.
- 19 for one course each in Latin, French, algebra, and geometry.
- 17 for one course each in arithmetic, bookkeeping, stenography, and typewriting.

10½ for one course each in cooking, sewing, dramatic art, and physical education.

20½ for the best 1 per cent in initial ability.

1½ for the lowest 1 per cent in initial ability.

11 for the average white pupil.

1½ for the average colored pupil.

The gain from the more intellectual studies is larger relatively to that from cooking, sewing, etc., than it was before, but so also is the gain due to greater initial ability. . . .¹

It should be emphasized at this point that no large difference existed in the influence of various subjects on the abilities measured. The differences were influenced by the materials of the test. Some subjects, for example, influenced growth in word knowledge more than did others, and some influenced most the development of abilities involving numbers and space. Latin and French, as might be expected, showed their influence most on word knowledge; algebra and geometry caused relatively greater development in the tests of number and space. Conceivably, one could choose tests that would reflect greater training effects of given subjects such as science courses, while others would favor mathematics; and some tests of a definitely verbal nature would show that English, Latin, and French have the greatest disciplinary and transfer value.

The conclusion to be drawn about the effects of specific school subjects on mental abilities is that no important differences occur. We can say definitely that subjects cannot be chosen for their disciplinary value or for a general improvement of the mind. There is a definite implication that a pupil should have as wide an experience with a number of different subjects as possible and that we cannot depend on a limited curriculum to give him the richness of mental experiences that he should have.

¹ Thorndike, E. L., Mental Discipline in High School Studies, *Journal of Educational Psychology*, 15: 94, 1924.

Let us return to the topic of discipline and transfer according to ability. Comparison has been made of three groups: the highest 1 per cent, the average, and the lowest 1 per cent in ability. In the case of no group were the disciplinary and transfer effects large. It was very small in the case of the poorest 1 per cent of the high-school pupils. The average group developed about seven times as much as the poorest and the brightest about twice as much as the average. Not too much significance should be attached to the numerical comparison of the development according to ability, for the quantities involved are small. If the development of one group is several times that of another whose growth is very small, the development of the superior group is still small and of not much importance, even though it is several times that of another.

An important fact is that in this experiment, also, it was discovered that bright children profit more from a situation than average children and that average children, in turn, profit more than dull children. Practically all experiments indicate that the transfer and disciplinary values of subjects tend to vary according to the mental ability of the pupils.

Transfer Effects of School Subjects. Questions raised in connection with this topic are largely on the extent to which experience in one subject helps in another, but interest also centers in the training and transfer value of specific school subjects in respect to vocational situations. The topic of transfer from subject to subject raises questions, for instance, about the help that Latin gives pupils when they study French, and vice versa; the extent to which a study of geometry helps a student appreciate art and design; how foreign language helps in the spelling and definition of English words; how extensively the addition process transfers to multiplication; the extent to which formal grammar improves written and spoken English; how much a knowledge of psychology improves teaching methods; how methods of teaching influence the practices and habits of pupils; and what contribution civics and sociology make to citizenship.

The Transfer from Languages. When the German explained, "I could English speak before I to America came," he furnished an example of transfer from the German to the English. In this example, transfer results in awkward expression and may be described as interference, or a negative transfer. German will aid in understanding the English language when there are elements in common, but interference occurs when there are conflicting elements.

Investigations have been conducted that indicate how foreign

languages help students in spelling and defining English words. Latin and French, for example, do help in this respect, but the transfer varies according to the nature of the words. If the English words are not derivatives of French or Latin, there is essentially no transfer; if they are, then transfer occurs.

It was discovered in a study of the effect of Latin on the ability to spell words of non-Latin and Latin origin that the study of Latin improved ability involving words of Latin origin. The usual technique of testing is that of measuring the spelling ability at the beginning and also at the end of the year to gauge the gains made during the year. Then the effect of a year's study of Latin on spelling ability can be tested. Words of Latin and non-Latin derivation were used, and the pupils who studied Latin showed essentially no more ability to spell words of non-Latin origin than those who had not studied it. The Latin students, however, did spell correctly more English words of Latin derivation than the non-Latin students. The difference was not large but enough to indicate some transfer, which apparently took place according to the principle of identical elements. When, however, an attempt was made to improve spelling of Latin derivatives by pointing out similarities, even greater improvement resulted in spelling English words of Latin origin. In general, there was no transfer to words without Latin elements; there was some to the Latin derivatives; and most took place when the teaching was directed toward bringing about transfer. This point is emphasized later in the chapter.

The argument has been advanced that a knowledge of English words is increased by a knowledge of other languages. Latin, especially, has been supported on the basis that a knowledge of it transfers to English and consequently increases one's ability to use and define English words. French, too, has been defended as having similar transfer value.

In general, transfer occurs from Latin and French to English. Not all investigations are consistent in showing such a transfer. Most of them do, however, and it is safe to conclude that some transfer takes place. The amount of transfer depends to a considerable extent on the teaching method. If the teacher consciously works to improve the knowledge of English words by pointing out roots and derivations, the amount of transfer is considerably greater than when no attempt is made to point out relationships and similarities.

Latin and the Increase of English Vocabulary. The principle of transfer can be well illustrated by considering the effect on English vocabulary of studying and of not studying Latin. One study of this problem indicates that the growth of vocabulary is limited to words of

Latin origin. At the end of the first-year Latin course the gains of the pupils who had taken the course were compared with those of the pupils who had not studied Latin. Two lists of words were used. One contained 25 English words derived from Latin words included in the Latin course. The other contained 25 words also, but they were derivatives from Anglo-Saxon and Greek. On the basis of the test list containing Latin derivatives the Latin students gained 5.5 words, and the non-Latin students gained 2.0. The gain of the Latin over the non-Latin students was 3.5 words. According to the list of words that were not of Latin origin the students who had studied Latin for a year gained 1.2, and those without Latin gained 1.4 words, a net loss of 0.2 word for the students of Latin, a loss that may be called inconsequential in terms of gain or loss. Nevertheless, it is important in showing that no transfer occurs for non-Latin words.

The transfer to Latin words is probably an important one, for a net gain of 3.5 words based on a test of only 25 words cannot be minimized. If Latin students are superior to non-Latin students to the extent of 3.5 words for every 25 words of Latin derivation, they possess a superiority in vocabulary that is especially important for those who are to enter the professions. This point of view should not be interpreted as implying that the most economical and effective way of learning English words of Latin origin is to learn them via the Latin route. Probably the understanding of words can be acquired best by studying them directly rather than indirectly through Latin. Possibly for those who need a broader background of scholarship, however, such as the teacher, lawyer, and doctor, some Latin may be worth while.

Transfer According to the Method of Teaching. If the teacher makes a conscious effort to bring about transfer, then more transfer will take place. The Latin teacher, for example, can point out English words that are derived from the Latin. He can also point out the Latin roots in English words and build up in pupils a consciousness of and an ability to see the common elements in Latin and English.

One teacher of Latin included in her method for relating Latin to English the analysis of some of the more formal statements that appeared in the newspapers. The Latin elements of the words were underlined and the derivations explained and discussed. The number of English words that have Latin roots or are Latin derivatives in some of the speeches recorded in our newspapers is surprisingly large.

The facts are that when Latin is taught with a special study of derivatives a greater increase in English vocabulary results than when it is taught in the usual way. Most, if not all, investigations indicate

that more gain is made in the comprehension of English words when teachers of Latin devote some time to the analysis of English words. The gain is greatest in words that are Latin derivatives and very small or nothing for words not derived from the Latin. This fact is consistent with the principle of transfer according to identical elements or according to the extent to which the elements in the two situations are similar.

Summary of the Amounts of Transfer. A summary of the investigations that have been made of the problem of transfer, as indicated in Table 16, reveals that in 70 per cent of the experiments considerable or appreciable transfer was found. It is not surprising that no transfer was found in a few studies, for in a number of experiments it is almost certain that the prevailing situations and the content will be of such a nature that no transfer is apparent.

TABLE 16. STATISTICAL RESULTS OF TRANSFER EXPERIMENTS FROM 1890 TO 1940*

Amount of transfer claimed	Number	Per cent
Considerable.....	53	25
Appreciable.....	95	45
Varies with conditions of learning..	16	8
Very little.....	20	9
No transfer.....	9	4
Others—duplications excluded.....	18	9
Total	211	100

* Adapted from table on p. 82 of P. T. Orata, Recent Research Studies on Transfer of Training with Implications for the Curriculum Guidance and Personnel Work, *Journal of Educational Research*, 35: 81-101, 1941.

There can be little question about whether or not there is transfer. The educational problem, for the teacher as well as the experimenter, is how to achieve the greatest amount of favorable gain in one situation as a consequence of experience in another.

MENTAL DISCIPLINE, TRANSFER, THE SCHOOL CURRICULUM, AND TEACHING METHODS

Of one fact we can be reasonably sure, and that is that we cannot depend on a few subjects to give the richness of experience and training that children need. A few subjects do not possess all the educational virtues. A study of a selected few will not train the mind and provide the information that is needed in many situations. Systematic and diligent translating of foreign languages, proceeding through the logical steps in solving mathematical problems, observing formal steps in grammar, etc., will not equip a person with the knowledge and abilities

needed in many situations. If one is preparing to be a teacher, he should acquire a thorough and comprehensive knowledge of the subjects that he is going to teach and also of the allied ones. In addition, he should have actual training and practice in teaching. Whatever subjects in psychology and education he may take as preparation for teaching should be brought into relationship with teaching methods. Applications should be pointed out, or else there may be little transfer to the teaching process.

The importance of actually applying methods and principles to teaching was forcibly brought to the attention of the author when he was delayed in meeting his class because there was so much confusion in making the assignment and distributing mimeographed material to the previous class. The instructor and students of that class occupied the room during the intermission between periods and also during part of the succeeding period, and there was considerable confusion. In response to the inquiry about the name of the class, the instructor replied that it was Methods of Teaching. Apparently, the teacher who was teaching how to teach did not practice what he preached.

In general, then, the student should take the courses that are related directly to the problem at hand. The indirect method, which depends on transfer and discipline, is uneconomical and wasteful. If one is going to prepare for the profession of law, he should in the later stages of his preparation take those courses which are most closely related to law. It would be unwise, for instance, to study courses in mathematics because its formal nature is purported to result in a formal discipline of the mind which prepares one to think logically and legally.

Nor should one study Latin and French for the sole purpose of understanding English. It helps to do so, but it is more economical to study English directly. The claims for formal grammar have also been exaggerated. The study of formal grammar does not result in an improvement in written and spoken composition at all commensurate with the time spent on it. More development results if much of the time spent on formal grammar is devoted to practice in improving written and spoken English directly.

However, one should not take too narrow a viewpoint and be guided by the principle that only subjects should be studied that fall squarely in a field or are directly related to the object at hand. If, for example, a student in college or even in high school is studying to acquire a fair degree of English and French, it would not be amiss for him to take a little Latin and Greek and also a little Spanish and Italian. It may readily be admitted that the most profitable way to study English and

French is not through studying the classical languages, Latin and Greek, or the romance languages, Italian and Spanish, but to devote the time to English and French. Yet for a person who desires a thorough knowledge of English and French, some knowledge of the more closely related languages will provide associations and give a background for a profounder understanding of English and French. Courses in other languages can be taken with profit, and the teachers should point out their relationships so that students may interpret them more comprehensively. Furthermore, there usually should be no hurry about students' finishing school, and most students have time enough to study allied material.

A student of history has a broader base for interpreting his materials if he is a fairly good geographer and is trained in relating geographical factors to historical events. The topics of discovery and exploration can best be understood in terms of climate, rivers, lakes, topography of the land, and natural resources. Similarly, our social and economic problems are related to these same factors and also have important historical implications. The War between the States (1861 to 1865), for example, cannot be adequately understood without an understanding of the geography of the North and South, their resources and products, and the conflicting social and economic forces.

In each of the fields, the languages, the social sciences (economics, sociology, history, and political science), and the natural sciences (physics, chemistry, and biology), there are interrelationships that should be emphasized. Facts in various fields should be brought into connection. The thrilling relationships of knowledge make it educationally unwise to try to approach a problem in too compartmentalized a way. Related facts should be brought together regardless of the field from which they are taken. Much better education will be produced by bringing to bear on a subject the pertinent facts from many fields.

Point Out the Relationship. In order to get the most out of any topic of study, its relationship to others should be pointed out by the teacher. In addition, she should encourage her pupils to look for relationships. Experimentation on transfer has made it clear that we cannot expect much unless teacher and pupil are conscious of the interrelationships of knowledge and attempt to generalize knowledge or apply it widely.

The question is less that of the existence of formal discipline and transfer than that of instructional methods. Teaching should be planned to bring about transfer. A related problem is to bring knowledge and information together that logically belong together and not to compartmentalize them as we now do. If the teacher of Latin and Greek, for

instance, discusses prefixes, she should point out their extensive use and even help the students to find examples of their uses. For example, the prefix *hypo-* is used with words occupying several columns in the unabridged dictionaries; words with the prefix *hyper-* occupy several columns, also. These and other prefixes are important. A knowledge of the extensiveness with which different prefixes are used will help make language teachers more sensitive to the opportunity of sharpening a pupil's awareness of prefixes and of enlarging his background for understanding the meaning of words with prefixes.

History is often compartmentalized as a separate subject consisting of dates, battles, wars, and the recitation of various events. But it should be a story of the past describing and explaining the forces and factors that cause people to behave as they do. True history of this type will help us understand people, interpret their behavior, and predict what they will do under certain circumstances. History treated richly is broader than history taught in the usual mechanical way and brings in focus historical problems; the psychology of human nature; numerous geographical facts and principles; the economic forces involved; the beliefs, traditions, motives, and attitude of the people; and the other forces that underlie human behavior. We cannot expect "date, name, and battle" history to transfer to everyday living and to help students interpret the social and economic problems of the present day. History will do that only when it is conceived more broadly by scholars and teachers and made a living subject rather than a dead one.

As a student, the author took a college course in history called The Modern World, which included the seventeenth, eighteenth, nineteenth, and twentieth centuries. He had just lived through the First World War, was intensely interested in the world-stirring events that had taken place, and hoped to obtain an interpretive basis for understanding them. Instead of being living and vital, the course consisted, by both "lecturer" and students, of a superficial recitation of events anchored to their dates. Before the great events of the twentieth century were reached, the course ended, and it was just as well.

It may be maintained that because of the form the work took—memorizing details, dates, and events—the course had good disciplinary values. However, no one in the light of modern psychological findings on that topic could seriously defend this. According to the findings, little transfer to present-day events would take place. Instead of keeping history buried in the vault of the past by making it merely a monotonous and mechanical procession of past events, it could be made the roots of the present. We could learn to trace present situations back

into the past and thus interpret the present more profoundly. Whether history as a subject is merely rattling the dead bones of the past or the living story of man's attempt to adjust to his environment depends in large part on the teacher. He has to plan his assignments, organize the material, and ask questions or stimulate his pupils so that they achieve a wide orientation to the field of study.

Subject Matter and Function. Experimentation has shown that the values ascribed to the study of formal subject matter according to certain theories of discipline and transfer of training are not so great as has been claimed; consequently, educators have turned their attention to the selection of subject matter that is actually used by the people. For example, in arithmetic, studies have been made to determine the arithmetical processes that are actually used. The arithmetic used by bank clerks, store clerks, and housewives has been determined by finding out the arithmetic that they need in their everyday occupations. Examination of newspapers and periodicals has also revealed the quantitative materials that are met with in one's general reading. As a result, in present-day arithmetic we do not find problems that fall far outside routine experience. In modern arithmetic lessons the hound is not sent after the rabbit, who has a 300-foot start, the pupils being asked to find out how many bounds the hound has to make to overtake the rabbit if the latter leaps 3 feet at a time and the former 4 feet. Nor do we mix 3 gallons of \$2 wine, $5\frac{1}{2}$ gallons of \$2.50 wine, and $7\frac{3}{8}$ gallons of \$2.75 wine to find what the resultant mixture costs per gallon. Problems in wallpapering, plastering, apothecaries' weights, surveyor's measures, etc., are found only to a limited extent, if at all, in the modern arithmetic texts. Problems of this type were once thought to have value in training the mind to reason logically; but because it has been learned that training values are not inherent in any specific type of problem, we now choose problems that are realistic, or true to life.

Spelling texts no longer contain about 25,000 words many of which never fall within the written work and the reading of either children or adults. Obscure words are now omitted from the spelling lists. Words that are actually used by children and adults are selected. Letters written by children and adults have been examined to discover the words actually used and misspelled. Children's compositions and other written work have been examined, also. Words most frequently used and frequently misspelled are listed according to such frequency and then classified by school grade. It is much more to the point to learn to spell the words that we use than to spell obscure words that

occur seldom, if at all, in either our writing or our reading. To a large extent, this principle applies to other fields of study.

Investigations of the effect of the study of formal grammar on spoken and written English indicate that it has little value. The values from the practice of parsing sentences and elaborately diagraming them to indicate the various parts of speech transfer very little if at all to speech and composition. A few decades ago it was contended, and with little contradiction, that such formal practices produced disciplinary values for developing the power to reason logically, sharpening the faculty of making fine distinctions, increasing the power of attention, and developing accuracy. Not only are these powers not developed, but negative results occur. The practice of laboriously analyzing sentences grammatically develops habits that cause one to read less fluently.

Grammar can be used to improve written and spoken English but will not do so if the matter is left to chance. As with spelling, the most effective approach to the problem of improving speech and writing is to bear in mind the common grammatical errors. Studies have been made to determine the most common errors by observing and recording those which children make in their speech and in their writing. Most common errors involve subject and verb and the cases of the personal pronouns. For example, a common type of error is the following: *One of the girls are going to the country.* The verb and the subject do not agree in number. In such an instance, when the error is at hand and the correction is being pointed out and explained, the teacher can set forth some of the grammatical principles covering the specific errors.

A common error is also illustrated by the phrase *between you and I.* In explaining that the phrase should be *between you and me*, it helps to give the reason by pointing out that the preposition is followed by the objective case of the pronoun. When grammatical facts are applied to specific errors, they serve as reasons and explanations and provide direct aid in correcting and preventing errors.

A difficulty in employing grammar in this way lies in the fact that grammar cannot be used to explain to the younger children the nature of their errors. Children acquire their language from their environment. If they hear only good language, they will speak correctly. If they hear defective language, their speech will reflect this experience. Young children will have to be taught the correct form without being given the reason for it. When lower grade pupils become "grammar-grade" pupils, they will still persist in most of their errors and then they can be given grammatical explanations.

Formal Discipline and the Training of Pupils. Even though it may readily be granted that subjects whose values are not very apparent should not be studied because of purported disciplinary values, teachers must not overlook opportunities to train their pupils in the habits of good scholarship. The teacher's methods and procedures may, on the one hand, help to develop in pupils carelessness, indifference, and inability to concentrate or, on the other, train them to express themselves clearly and fully, prepare their lessons carefully, and maintain attention to the problem under consideration. Considerable dispute may arise as to how pupils may be trained in the habits of good scholarship, but hardly anyone will deny the value of good classroom methods even though we no longer attribute disciplinary values to specific subjects. Under a good teacher, children will acquire the habit of being industrious and will develop a willingness to undertake difficult problems. But under poor control or if poorly motivated, they may become careless and indifferent. Their attention deteriorates into the type that flits about from one object to another. Discipline and training interpreted broadly in terms of the qualities and habits that characterize good and poor scholarship should be recognized as very important. The teacher should interpret her work occasionally in terms of its effect on the interest of her children; on their capacity to work independently; and, in general, on the habits of scholarship that they are developing.

The training that children receive in different school situations differs according to the control and motivation that exist in these situations. If assignments are indefinite, if the children are uncertain, if there is much disorder, and if confusion characterizes most of the activities, the pupils will develop poor work habits and become less effective in dealing with school situations.

Training and discipline are important in this sense. But though we train children so that they have the technique for solving their school problems, we are not sure that they will have the ability to attack other problems or that the habits and characteristics acquired in school will carry over into adult life. Possibly there may be some carry-over, for habits acquired in childhood are stubborn and tend to persist a long time. Even if there is no transfer, however, good training during and for the school situation is important in itself. A common aberration in our thinking is to conceive of training and discipline as intended for a situation or time different from the present. It is significant that the teacher develops interests and good habits for the situation at hand. It probably is not most desirable that the teacher

have foremost in mind the training or discipline of her pupils for adult life situations. The immediate situation is primary. That good training persist and that it carry over to all situations is, of course, to be desired. The "carry-on," or "carry-over," quality of training should be looked for, for a pupil may be well controlled in one situation but in others show no such effect. Still, the education of the child for his present should govern the teacher more than concern for his future.

Children in the schoolroom, because of strict control, may prepare their lessons diligently and recite according to a fixed pattern. The teacher makes assignments; the pupils prepare and recite them to her. They go through the "form" of lesson getting. Generally, the desired habits, or "disciplines," of scholarship are not established, for the pupils study under compulsion and are working for such artificial rewards and external satisfaction as teachers' approval. Most students cease to study as soon as they finish school. There is little carry-over, for they have had no true motive for learning. They were compelled by teacher-pupil relationship to study, but little if any propelling interest was generated. Most of our formal educational work of the compulsion, lock-step type shows little carry-over, and the graduates of our schools carry on practically no independent study. When the compulsion of the teacher is removed, the pupils manifest no habits of scholarship. Formal processes directed from the outside, which involve much repetition, do not result in the establishment of controlling aims and dominant habits. Mere mechanical form or "going through the motions" under direction does not develop habits that govern behavior. Only activities that are permeated with interest, motive, purpose, and their associated feelings will result in a training and mental discipline that has significant value.

SUMMARY AND REVIEW

Transfer refers to the transfer of knowledge, training, and habits acquired in one situation to another situation. Mental discipline refers to the training and discipline of the mind, which results in improved power to reason, visualize, imagine, perceive, concentrate, etc.

The curriculum of a half century ago was determined and defended in terms of disciplinary and transfer values, and a few educators today still believe that the study of a certain few subjects will cause such values to be achieved.

The engineering school with few practical subjects but with a strong academic curriculum graduated good engineers, probably not so much because of the values in the training for engineering but because

only comparatively few of the very best students finished the course. Today this university has a large engineering college with much practical and applied work.

According to the theory of generalization there is transfer when the principles or ideas acquired in one situation are applied to another situation. Experiments have indicated that there is such transfer but that there is more transfer when the applications are pointed out.

According to the theory of identical elements there is transfer from one situation to another to the extent that there are identical or common elements in the two situations. Experiments support this theory, although the amount of transfer is probably not exactly proportionate to the number of identical elements.

There is more transfer for bright children than for average and more for average children than for dull. In short, the amount of transfer corresponds in general with the intelligence of the learner.

Positive transfer from one language to another takes place in terms of similarity. Negative transfer takes place when the structures of the languages are conflicting. Evidence indicates that the study of Latin does help one to understand English words, but only those which have Latin elements.

A summary of the experiments on transfer conducted from 1890 to 1940 shows that in 70 per cent of the experiments there was appreciable or considerable transfer.

In order to obtain transfer the teacher should work for it by pointing out relationships and making applications. If she does so, much more transfer will be achieved and learning will consequently be greatly broadened.

Even though mental and formal discipline are not now generally accepted as important educational values, the teacher should not overlook the opportunity for training and educating pupils in good methods and habits of living. She should check her teaching in this regard by noting the behavior that her students actually develop.

Test Your Thinking

1. Let us assume that for some reason the brightest students, and only the brightest, took one course in typewriting in high school and also one course in college. What values would soon be attributed to typewriting?
2. If a person has been trained to reason carefully in zoology, for example, and draw conclusions based only on carefully validated facts, then he will surely do the same when he is thinking about the candidates for the presidency of the United States. Comment.
3. The present school curriculum has several times as many subjects as it

had in 1900, for example. What is the connection between this fact and present-day psychology of mental discipline and transfer of training?

4. It might be said that the arguments given in favor of the engineering school in its first phase (see page 366) were really rationalization. Comment. Do you think that the same arguments are used now that the engineering school has an extensive, modern plant?

5. Define the theory of generalization, and give a few examples to illustrate.

6. Give some evidence showing improvement or failure to improve because of transfer resulting from generalization.

7. There will be more transfer from Latin to Italian than from Latin to Swedish. Explain.

8. Give some illustrations of transfer according to identical elements.

9. Discuss amount of transfer according to mental ability, and show that the facts are consistent with other psychological facts about advantages accruing to the bright and disadvantages to the dull.

10. How can teaching facilitate transfer?

11. On the basis of the amount of transfer according to the 211 experiments reported by Orata, discuss whether or not we are justified in teaching with transfer or discipline in mind.

12. Discuss fully what the teacher can do to achieve maximum transfer values and also disciplinary or training values.

References

- BARLOW, M. C.: Transfer of Training in Reasoning, *Journal of Educational Psychology*, **28**: 122-128, 1937.
- BROWNELL, W. A.: Theoretical Aspects of Learning and Transfer of Training, *Review of Educational Research*, **9**: 255-273, 1939.
- COXE, WARREN W.: The Influence of Latin on the Spelling of English Words, *Journal of Educational Research*, **9**: 223-233, 1924.
- HENDRICKSON, GORDON, and WILLIAM H. SCHROEDER: Transfer of Training in Learning to Hit a Submerged Target, *Journal of Educational Psychology*, **32**: 205-213, 1941.
- MOORE, EVELYN B.: Study of Scientific Attitude as Related to Factual Knowledge, *School Review*, **38**: 379-386, 1930.
- ORATA, PEDRO T.: Recent Research Studies on Transfer of Training with Implications for the Curriculum Guidance and Personnel Work, *Journal of Educational Research*, **35**: 81-101, 1941.
- ORATA, PEDRO T.: Transfer of Training and Educational Psuedoscience, *Educational Administration and Supervision*, **21**: 241-264, 1935.
- SALISBURY, RACHEL: A Study of the Transfer Effects of Training in Logical Organization, *Journal of Educational Research*, **28**: 241-254, 1934.
- THORNDIKE, E. L.: Mental Discipline in High School Subjects, *Journal of Educational Psychology*, **15**: 1-22, 83-98, 1924.
- THORNDIKE, E. L., and G. J. ROGER: The Effect of First-year Latin upon Range in English Vocabulary, *School and Society*, **17**: 82-84, 1923.

CHAPTER XVIII

FATIGUE, DRUGS, ATMOSPHERIC CONDITIONS, AND EFFICIENCY

What to Look For. Be able to describe the mental efficiency of pupils during the course of the school day.

What are the problems of fatigue, and what can be done to prevent fatigue?

Be able to describe the relation between feelings of fatigue and actual fatigue. The effects of loss of sleep on efficiency are described and should be understood.

Note the relationship between physical and mental fatigue and the factors that cause fatigue, both physical and mental.

The drugs discussed are caffeine, nicotine (tobacco), alcohol, strychnine and benzedrine sulphate (pep pills). Learn the effects of these drugs on efficiency. Note individual differences in their effects.

What are considered the ideal temperature and humidity, and under what conditions can efficiency be at a maximum even though the temperature and humidity are considerably above the ideal?

What do you think are the actual effects of high temperatures and humidity on efficiency?

SUSTAINED MENTAL EFFORT AND EFFICIENCY, MENTAL FATIGUE

Efficiency throughout the School Day. Can a pupil learn as well at the end of the day as he can at the beginning? Does the school child become so mentally fatigued from doing his lessons that he is unable to do his work as well in the afternoon as in the morning? These questions pertain to mental fatigue and its effect on learning ability.

From a practical point of view, there is no true mental fatigue. Children have been tested at different times of the school day to discover their power to repeat digits,¹ multiply, add, read, insert the missing words in incomplete sentences, and do other tests of mental efficiency.

¹ The test of power to repeat digits is commonly referred to as a test of *digit span*. Numbers, or digits, such as 4, 2, 9, 7, are presented either orally, when the examiner reads them at a regular rate of usually one digit a second, or visually, when they are

The results indicate that abilities change very little throughout the school day. On the average, children are as capable of doing mental work at three o'clock in the afternoon as they are at nine o'clock in the morning. If anything, there is a slight tendency to do better in hours other than the first hour of the day. The differences are so slight that it is probably most accurate to conclude that during the school day the mental and learning abilities show no material decline or fluctuation because of mental fatigue.

Even though pupils do not become mentally fatigued during the school hours, still they may feel tired. A feeling of fatigue may cause them to be less efficient, unless the circumstances of the schoolroom cause them to work at top speed. Any decrease in performance during the school day is caused not by a reduction of actual capacity but by lagging interest, restlessness, and a feeling of being tired. Sitting in a seat for several hours causes some muscles to become tired, and the pupil often gets bored by the monotony of the situation.

With the passing of the day, a mind-set develops for the after-school activities, and consequently the pupil concentrates less on his lessons. Thus, in a practical sense, the teacher does have to contend with decreasing efficiency on the part of her pupils. They can do as well at the end of the school day as at its beginning; but in the typical schoolroom she finds it harder as dismissal time nears to interest them and to maintain her own alertness and interest. Neither teacher nor pupils feel so able to work as earlier in the day, and their general behavior shows it. If the pupils were placed in a test situation, they would do about as well as at any other time of the day; but the usual control during the school-day routine is not so rigorous as that of a test situation. Consequently, the children are apt to slump toward the end of the school day. The teacher's problem is a practical one. It consists in arranging her program so that the pupils and she will work more zealously when it seems harder to concentrate.

Various investigations of efficiency throughout the school day generally consist in testing the ability of school children with arithmetic tests, tests of memory, and other tests. The general course of ability shows an increase from the beginning of the school day until noon. No fatigue should manifest itself during the morning; in fact, there is a tendency for efficiency to increase slightly during the course of the morning.

presented for a short period. By means of digit-span test it may be discovered how many digits a subject can repeat without error. Three-year-old children can usually repeat on the average three digits; ten-year-olds, six digits; superior adults, nine.

The facts hardly warrant charting a precise course of efficiency. It may safely be said that actual fatigue is not an important factor and that efficiency does not decline by an important amount throughout the school day. Even though there is a slight decline of pupils' ability in the afternoon, the problem, apparently, is one not of their actual efficiency but of their feelings toward their work.

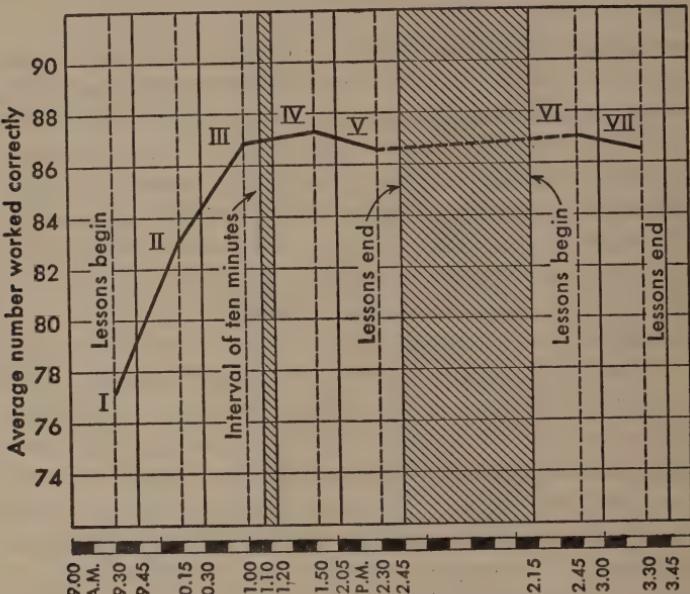


FIG. 21. Changes of lessons are shown by continuous lines, and times of testing by interrupted vertical lines. (After Stainer, 1929.)

The first and last hours of the school day are not the most efficient. During the first 2 hours of the day there is an improvement in efficiency, which reaches a level quite uniformly maintained until the last hour, when a decline sets in. The improvement at the beginning of the school day is probably the result of "warming up," and the decline at the end is caused by a dropping of interest and the letup that usually accompanies the anticipation of the end of the school day. For younger children, continued mental effort over the length of the school day is known to result in a true and considerable decline in the ability to sustain that effort.

Figure 21 shows the curve of ability to add. The rise in the curve indicates a more rapid increase than is actually the case, for the curve begins, not at zero, but at approximately 77. In general, then, most

findings agree with those indicated in Fig. 21, showing that the periods of greatest output are between the end periods.

School Subjects and Hours of Day. The investigations of mental fatigue have demonstrated that there is no need to schedule certain school subjects for the beginning of the school day on the ground that they are more fatiguing than others. A common belief has existed among teachers that arithmetic, for example, should be scheduled for the beginning of the school day because it should be studied while the children are fresh. It has also been recommended that other subjects, such as reading, grammar, history, and geography, should be placed at the beginning of the day's schedule. There is no need to differentiate subjects on this particular basis, for pupils are essentially as able to learn at one time of the day as at another.

In one school, for example, it proved desirable to teach arithmetic in the last hour of the school day. A teacher had explained to her superintendent that she had difficulty in maintaining the interest of her pupils during the last hour of the afternoon. She was teaching history during this period, and she complained that the pupils were restless and inattentive. The superintendent recommended that she teach history, which called for little activity as it was being taught, in the first part of the day and have arithmetic in the last hour. The teacher thought that arithmetic was too "hard" a subject for the last hour of the day. She was told that subjects differed little in that respect and that she should try it. The arrangement proved most satisfactory. The activity that the arithmetic called forth overcame the boredom and listlessness that had been apparent during the teaching of a subject that had required much less activity of the pupils. But now the pupils worked with pencils and paper at their seats; they were active at the blackboard; and short drills and exercises also maintained attention.

Actual mental fatigue could be induced during the span of the school day if the attempt were made to do so. (Such an attempt would, of course, be foolish to undertake.) If pupils had to work at only one type of task, such as solving arithmetic problems, memorizing poetry, learning the meaning of words, or writing compositions all day, they would not be so capable at dismissal time as at the beginning of the school day. A small decrease in these abilities might set in by the end of the morning; immediately after the noon hour the pupils would be nearly as effective as ever; however, before the school day was over, decline that could be attributed to actual fatigue would set in.

True, or actual, fatigue is avoided by varying the school program; practical fatigue, boredom, or loss of interest can also be prevented to

a large extent by avoiding monotony. Recesses occur in the middle of morning and afternoon sessions; drawing, shopwork, and gymnasium are scheduled between academic subjects to relieve the strain and loss of interest that develop from continued application for long periods to similar kinds of schoolwork. It is important that the schoolwork be judiciously varied and balanced so that interest can be more easily maintained during the school day.

Even though actual mental fatigue does not set in during 2 to 4 hours of mental work to impair mental power materially, interest in the work that is being done declines considerably. A person can translate French, mark papers, memorize geography facts for a period of 2 or 3 hours with a loss of efficiency of less than 10 per cent, but his feelings of zeal and enthusiasm for the work he is doing decrease materially during that period. The practical problem for teachers who direct learning and for those learners who have control of their own time is to vary their tasks as far as possible in order to maintain maximum interest. The problem is one fundamentally of interest rather than of fatigue.

The effect on mental efficiency of 3 hours of work involving reading, defining words, detecting word relationships, and working arithmetic problems has also been tested by measuring efficiency before and after the long period. College students have been found as capable at the end as at the beginning.

Instead of giving a test before and after a long period of mental work, efficiency may be checked by changing the order of the tests so that various groups will take a given test at the beginning and others will take it at the end of the period. If a decrease in ability occurs, because of mental fatigue, a comparison of the scores will show that the scores for the test taken last are smaller. Several thousand adults were tested between 8 and 10 P.M., and a comparison of the scores of the various groups taking the test first with those taking it last showed that ability in a mental-test situation was just as high at the end of that period as at the beginning.¹ Most of these adults were professional and semiprofessional people whose work may be described as mental in nature, but at the end of a 2-hour testing period comparatively late in the evening they were just as capable as ever.

In another situation, efficiency might decline. If, for example, students listen to an ordinary lecture from eight to ten o'clock in the evening, their attention probably will wander a good deal, particularly

¹ Based on unpublished research by the author.

during the last hour. A few may even fall asleep, and only a comparatively few will pay active attention. In a test situation, however, students are equally capable throughout a long period of 2 or 3 hours. Unless the situation calls forth the complete attention and power of individuals, as does a test or examination, a group of children or adults is apt to behave as if fatigued during a class period, lecture, sermon, or other situation where they are passive.

A theory has been advanced, for which there is some experimental evidence, that the mind protects itself by operating in short cycles interspersed with short rest periods. Thus, if a child is working arithmetic problems, his attention is released periodically. These cycles of work with short rest periods tend to keep the mind efficient over a long period. This is advanced not as an established fact but as a partly substantiated theory that may explain why the mind maintains its efficiency so well over a comparatively long period.

Even though the mind does not become truly fatigued during the usual school day, the conclusion should not be drawn that mental fatigue is not a reality. It is an actual condition but is brought about only by severe and sustained mental work. This fact was demonstrated by Miss Arai, who multiplied four-place numbers by four-place numbers mentally for periods of 11 hours during several days. She first memorized the numbers, such as 8,743 and 5,964, and then proceeded to find their product. She did the multiplication mentally. After 11 hours it took her about twice as long to get the answer, and also the amount of error increased slightly. In other words, at the end of 11 hours, her efficiency was about 50 per cent of what it was at the beginning of the period.

At the end of her 11-hour periods of mental multiplication, Miss Arai memorized 40 German words. The significant fact brought out in connection with this is that the loss of efficiency in learning German because of 11 hours of multiplication was only one-fourth as great as the loss of efficiency in the multiplication itself. This indicates that, when fatigue has set in for a given task, if the subject changes to another task the efficiency for the latter will be greater than for the former. Again, it seems that variety or a change of activity prevents to a large degree loss of efficiency because of mental fatigue.

In connection with the problem of fatigue the age factor should be considered. The younger students cannot concentrate so effectively on formal schoolwork for as long periods as the older. Types of tasks that require systematic study are not so fatiguing to upper-grade, high-school, and college students as they are to preschool and lower-grade

pupils. Consequently, the work for beginners should be less formal and should consist to a greater extent in activities and projects that capitalize on the natural tendency of children to be physically active.

Feeling Tired and Efficiency. A study of the relationship between feeling and efficiency shows that efficiency in some tasks increases, whereas feeling about the work is one of tiredness. The scale of feeling included seven degrees: (1) extremely good; (2) very good; (3) good; (4) medium; (5) tired; (6) very tired; (7) extremely tired. In an experiment, four different tasks were performed, each for about $5\frac{1}{2}$ hours. They consisted in the addition of two-place numbers, sentence completion, rating compositions according to a scale, and intelligence tests. In the addition test, each subject, using one of the terms given above, reported how he felt at the end of each 30 minutes of work. In the test of ability to fill in the missing parts of a sentence the subjects reported individually on how they felt every 21 minutes; at the end of every 10 compositions rated and at the end of each 21 minutes, in the case of the intelligence tests, the subjects described their feelings as being extremely good, very good, good, etc., as given above.

Figure 22 shows the relationship between a feeling of fatigue and actual, or true, fatigue. The solid line representing actual achievement reflects the course of actual fatigue over the work period of about $5\frac{1}{2}$ hours; the dotted line indicates the feeling of the worker toward the task.

In all tasks the feeling of fatigue is more pronounced than actual fatigue. Thus, even though a subject is becoming increasingly tired of the work, his efficiency can still be maintained and possibly even be increased, as in the case of the subjects taking the intelligence test.

The relationship between the curves for performance in the addition of two-place numbers and the feeling for that task is different from the rest in that they parallel each other more closely and also in that efficiency reaches a point almost as low as the feeling for the work. Possibly in the simpler, more monotonous and routine tasks the actual output follows feeling for the work more closely than it does in the performance of tasks and functions that are more diversified and complicated. Thus, one will maintain efficiency in the functions employing the higher mental processes but not in the simpler functions, even though the feeling for the simpler and less varied tasks takes about the same course as does the feeling for tasks involving a higher order of response.

Rest periods, it may be observed, change the feeling toward work more than they change actual performance. Rest improves the feeling toward the work but has little effect on the work itself. This is to be

expected, for there is no actual fatigue but only an attitude of fatigue. One's feeling toward his work is very important, and rest periods probably are most important because of their psychological effects. They improve the feeling for work.

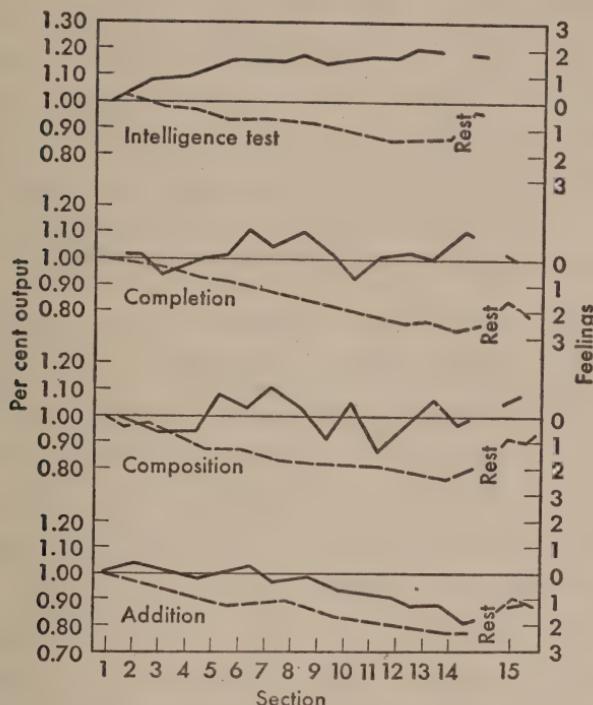


FIG. 22. Relation between output and feelings in four forms of mental work. Solid line represents output, and dotted line represents feeling record. (After A. T. Poffenburger, *Journal of Applied Psychology*, 12: 459-467, 1928.)

Loss of Sleep and Mental Efficiency. Teachers at times complain that some of their pupils are too sleepy in class to learn as much as they might. They accuse parents of permitting their children to stay up so late at night that schoolwork suffers the next day, and they maintain that students lose efficiency when they lose sleep.

Experiments have been made that help to answer questions concerning loss of sleep and efficiency. They have demonstrated the effects of loss of sleep on mental ability, strength of grip, speed of tapping, and ability to aim a gun accurately. In several experiments the sleepless periods were 60 to 70 hours long. The length of such periods can be appreciated when we realize that ordinarily the maximum period that

a person goes without sleep is about 20 hours; such a period of sleeplessness generally means that going to bed is postponed until three or four in the morning. Even at the end of 20 hours, a person feels very sleepy and tired.

The general results of experiments on sleeplessness indicate that one sleepless night causes hardly any decline in efficiency. The abilities measured by intelligence tests, for instance, are just as high after a night without sleep as before. This is true of practically all abilities. In this connection, however, the factor of effort must be recognized. In the experimental situation, those who were deprived of sleep keyed themselves to maximum effort and thus overcame the effect of sleeplessness. In the ordinary circumstances of the classroom, home, or office, children and adults would be more likely to yield to their drowsiness.

Toward the end of the 60- to 70-hour periods of sleeplessness a definite decline in mental efficiency was apparent. The time required for doing a task increased, and errors were more frequent. Most of the loss occurred toward the end of the period. In addition, the subjects developed nervousness, headaches, a dazed condition, and disturbances of speech. Evidently, up to a certain point, a loss of sleep may even act as a stimulant, but prolonged sleeplessness exacts a heavy penalty.

Complete recovery of mental power lost because of a long period of sleeplessness is brought about by a normal period of sleep. An 8- or 10-hour sleep following the long period without sleep restores mental powers to normal, though a person may not feel fully recovered. It is altogether possible, however, that exhaustion due to inadequate sleep over an extended period of weeks or months would not yield so readily to the resumption of a normal routine. There is no psychological evidence against a program of living that provides for reasonably regular and substantial periods of sleep.

In an experimental situation in which subjects were awake for 100 hours there was great loss of physical and mental efficiency during the last few hours of the 100-hour period. For example, there was no very great loss of memory at 72 hours, but at the end of 96 hours the ability of the subjects was only one-fourth to less than one-half of their normal ability. Prolonged lack of sleep caused dozing and falling asleep, extreme difficulty in paying attention, irritability, restlessness, and reduced ability to study, and staggering. After the period of sleeplessness the subjects had extra sleep to the extent of 29 to 86 per cent of the 100 hours lost, but it took a week before they no longer felt the effects of the long period of sleeplessness.

Prolonged sleeplessness causes actual fatigue, it is true, but we should not interpret a feeling of sleepiness as necessarily indicating actual fatigue. We may occasionally feel sleepy and tired without having our actual efficiency impaired. If, when sleepiness and fatigue seem to overtake us, we eagerly attack a problem, we shall be as efficient as ever, for a few hours at least. It is customary for us to identify the feeling of not desiring to work with diminished capacity for work, but the two are often different. At times, we may be actually fatigued mentally without being clearly aware of our condition. Our feelings of tiredness are not a reliable index to our actual state of mental efficiency.

Both mental and physical work, if prolonged, appear to bring out reserves of energy. We may feel tired, but renewed effort results in continued efficiency for a long time after the initial feelings of fatigue set in. If, therefore, a pupil is to develop his powers, he should not stop studying as soon as he feels fatigued. By continuing beyond that point, he trains himself to study for longer periods. The psychology of fatigue indicates that, when a loss of interest, boredom, or feeling of tiredness sets in, we still have reserves of energy that have not been tapped. To experience mild fatigue is good training, for it conditions one for harder work. Acute weariness, however, should be avoided, for it conditions one to avoid the work that causes it. If one experiences the emotions that accompany too severe fatigue, he may develop a distaste for mental work. Some students are conditioned against study because at some time they have felt very tired and distressed from having worked too hard. The mild fatigue induced by sustained mental effort, however, trains a student for harder levels of work by developing his ability to concentrate and to ignore minor discomforts.

Need for Sleep and Relaxation. Sleep is an important factor in mental efficiency, but it is difficult to fix standards, or norms, of the amount needed by children of various ages, for children differ in their individual requirements. As a general guide, the following may be given. Children six to twelve years old require, on the average, about 11 to 10 hours; children twelve to fifteen, about 10 to 9 hours; persons from fifteen to adulthood, 9 to 8 hours, the amount varying inversely with age. Some may require a little more than the amount indicated in order to avoid tiredness, and for some the normal amount is less. Careful observation of the general condition of a child will reveal what for him are the best bedtime and rising time.

One of the best ways to avoid loss of interest and loss of efficiency is to have short periods of rest or a period of relaxation. The recess period and the periods between classes serve this purpose. If pupils

persist in being inattentive, the teacher might declare a short rest period or cause them to do a little marching. She should check the temperature and also the ventilation to see that these factors are conducive to attentiveness. Temperature and ventilation should be as ideal as possible.

Children and adults should practice relaxation. Taking a short nap is the best antidote for sleepiness and feelings of fatigue. A short nap either before or after lunch, after school, or just before the evening meal will tend to keep one fresh and free from tensions. It may not be convenient at school to take naps, although in many schools it is part of the routine for preschool and kindergarten children, but naps can be taken at home. Children are not inclined to take time off from play for a nap; but if they would do so, feelings of fatigue would be largely eliminated and efficiency would be increased. Adults should relax by taking regular naps and thus eliminate tensions and maintain maximum health and efficiency.

Physical Condition and Fatigue. A child or adult becomes tired because continued work exhausts the energy supply and causes toxins, or fatigue products, to be formed. We are not certain how mental work consumes energy and causes fatigue products. It is the common scientific opinion that thinking requires very little energy. But the fact must not be overlooked that mental work involves, not the nervous system alone, but also to some extent the whole body. The senses are used intensively, the eyes making hundreds and thousands of movements, and the muscles must support the body generally in a sitting posture. Consequently, fatigue is certain to develop.

Fatigue is caused by physical work because the activity of the muscles produces chemical products, or toxins, that reduce efficiency. These organic poisons—this tissue waste—resulting from use of the muscles produce feelings of fatigue as well as actual fatigue. It is believed that muscular, or body, fatigue causes mental fatigue also or that the two are not entirely distinct and separate and that body fatigue reduces mental efficiency.

A nerve is difficult to fatigue. It can be stimulated again and again, but its efficiency decreases very little. Furthermore, no researches have established definitely what fatigue poisons result from the activity of nerve tissues, as they have what fatigue poisons result from muscular work. Possibly, fatigue poisons affect the connections of the nerves, or the synapses, and thus reduce mental efficiency. Sight should not be lost, however, of efficiency in terms of both muscular and mental fatigue, and the two should not be regarded as being independent of

each other. If fatigue is interpreted narrowly in terms of limited nerve stimulation, one may overlook its wider significance in terms of physical and mental health. We know that mental and physical activity do produce fatigue and, if prolonged without adequate rest and recreation, may result in a state of nervousness and ill health that will cause a low state of efficiency for a long time.

The continued use of the eyes induces fatigue; if illumination is inadequate, too strong, too weak, or too glaring, fatigue is developed much more quickly. Consequently, the illumination of classrooms, laboratories, and libraries needs to be governed to protect the students. Good translucent shades, plenty of windows, and well-arranged artificial lighting will provide adequate light. Not enough light is a serious condition, but the wrong light, such as direct sunlight or reflection from shiny surfaces, also induces eyestrain and consequent headaches. With the aid of a light meter the amount of light can be tested, and adequacy can be determined by comparison with standards.

A child tires easily and becomes restless if kept in the same position for a comparatively long period. The restlessness of a child, the continual shifting of position, is an attempt to distribute the stress to various muscles and thus to reduce the amount of postural fatigue. Sitting, standing, and even lying in the same position induce fatigue in a short time because of the strain put on certain muscles.

Noise produces an impact on the nervous system through the ears, just as light stimulates through the eyes, and causes fatigue. Noises in the school building from machinery, the gymnasium, the music department, the hallways, and even the classrooms themselves contribute to pupils' fatigue. Schoolhouses are often situated where the loud and drumming sounds of the traffic—streetcars, busses, trucks, and automobiles—bear down on the pupils and teachers in the schoolrooms. Noises are often distractions. Even if pupils become used to them, they are objectionable. On the other hand, it is not necessary to work for gravelike silence. Most healthful of all is the hum of a busy room, not necessarily because the hum is desirable but because it is symptomatic of a healthy condition.

Various factors producing fatigue are both internal and external. Some of them are internal, such as teeth, tonsils, defective eyes, nutritional status, and inadequate sleep. If the teeth are in poor condition, the tonsils inflamed and diseased, the eyes strained, the body poorly nourished and insufficiently rested, the child or adult is almost certain to be low in energy, easily tired, and unable to concentrate on the tasks before him. A good program of health and physical education will

achieve much to maintain a child in such good physical condition that fatigue will not be easily induced.

External factors that induce fatigue are overstimulation, unhealthful clothing, inadequate ventilation, poor illumination, excessive noise, poorly adjusted seats, and even poorly adjusted schoolwork. If pupils from the kindergarten through college are engaged in too many tasks and activities, schoolwork, parties, dramatics, and athletic contests, they will be overstimulated. If schoolwork is either too hard or too easy, a fatigued condition will also be induced. Also, sharp, glaring light or light that is too strong or too weak, excessive temperatures or poor air are decidedly unhealthful in their effects and cause children to tire more rapidly than they would under healthful circumstances.

Breakdown attributed to overwork and fatigue is more often the result of fear, worry, repressions, and other tensions. Often associated with the poor mental health that brings about disorganization or breakdown are poor digestion, diseased tonsils, malfunctioning of the endocrine glands, and other forms of organic deficiency. Work continued for some time with the knowledge that certain standards of achievement must be met and with a limit set for its completion induces fear and worry. Certain emotional states are natural concomitants of some work situations. When the student is working hard toward the end of the course to avoid failing, when the graduate student is hurrying to complete his thesis, when the housewife is preparing a big dinner, the circumstances of the situations induce feelings and emotions that cause more wear and tear than the physical and mental fatigue induced by the work.

Many of the ill effects from work can be avoided by managing it correctly. The teacher should plan the work, make her assignments, and guide her children so that they do their work systematically and with a minimum of stress and strain. The tasks should be well distributed; drill periods should be short and interesting. The accumulation of tasks toward the end of the term can be prevented if the inordinate stress on examination and marks is replaced with an interest in the hygiene of the school and the health of the child. If these things are done, fatigue in its broader sense can be avoided. A child or adult, happy and content in his work, can expend an unusual amount of effort without being tired by his work or tired of it. However, when continued application causes overconcern, worry, and other tensions, the work should be left until one can approach it again with zest.

On the basis of the studies it is easy to draw the conclusion that in a practical sense there is no mental fatigue. Consequently, the

tendency may be to generalize that fatigue is a factor in the lives of school children about which teachers and parents need not be concerned. Such a generalization is too narrow, for it may cause the parents and teachers to overlook the problem of fatigue in its wider sense. Fatigue can hardly be restricted to that induced by mental activity alone. It is the product of mental and physical work, emotional stresses and strains, poor health, malnutrition, and other factors.

Many pupils are fatigued in the wider sense. The teacher, if alert, can note the symptoms of a tired child. If a child seems weary and lifeless, stands and sits with poor posture, and complains of being tired, he should be carefully observed and studied. Also, if he displays considerably less than an average amount of energy and seems to be poorly balanced emotionally, he is manifesting symptoms of fatigue. When the symptoms have been discovered, their causes should be sought.

Fatigue results from various causes. Possibly as important as any are nutritional factors. Many children do not get enough to eat; some get the wrong foods; others eat irregularly and have other bad food habits. Because of the low standard of living enforced on so many families, undernourishment causes many pupils to be tired and listless.

If schoolrooms are poorly ventilated, overheated, and improperly lighted, fatigue may be induced. The air should be reasonably fresh; care should be exercised to keep the room temperature in the low seventies; and the light should be adequate, but not too strong or glaring and not reflected from a shiny surface.

If a child is poorly adjusted to schoolwork because he has not the ability for it or because the teacher is too severe a taskmaster, he may react by being tired, or "lackadaisical," as teachers are inclined to call it. If he is overstimulated by too much activity and too many sensory impacts in the form of music, noise, motion pictures, etc., he may also become fatigued. Understimulation, too, may cause a pupil to be apathetic. He may become tired of just sitting.

In general, a pupil's work should be planned so that his habits of working, sleeping, and eating become wholesome. A good balance can be struck among work, rest, and recreation. By sensitiveness to her children's physical condition the teacher may be able to detect conditions that are causing them to seem tired, apathetic, and lethargic.

THE EFFECT OF DRUGS ON MENTAL EFFICIENCY

Are there any harmless drugs or stimulants that increase a person's learning power? This is a pertinent question, for some students and

people in general have the habit of taking certain drinks and sometimes drugs because they feel that they are stimulated by them. Drinkers of tea and coffee, which contain caffeine, feel more alert after a cup or two. Many habitually go to the soda fountain to be refreshed by drinks that contain caffeine. Some men and women drink whisky, wine, or beer in order to be stimulated mentally and physically.

Tobacco companies advertise the therapeutic value of tobacco that gives one a "lift." Some mental workers have taken drugs in order to maintain their efficiency over longer periods. In the attempts of some to maintain and increase their mental and physical alertness, drugs play an important part.

Obviously, a discussion of drugs in a book on educational psychology will lay the greatest emphasis on their effect on learning ability and personal development. But their effect on health may be of much greater importance. Even though their effect on learning ability and personal development is emphasized here, the reader should not be deflected from a consideration of the effect of their continued use on general health. If drugs do injure the health, then, of course, they impair mental and physical efficiency. Most of the studies of drugs and efficiency have been on relatively short periods of time; possibly the effects would be much increased over the span of a lifetime.

Elementary-school pupils are less involved in the problem of how coffee, tea, soft drinks, tobacco, alcohol, and "pep pills" affect a person's efficiency than high-school and college pupils. But they are involved to a certain extent, for the use of tea, coffee, "cokes," and tobacco falls within the experience of some of them. Questions are often raised about the effect of such stimulants on human behavior, and teachers should know the answers, of which the following discussion provides some.

Tobacco and Mental Efficiency. A number of studies have revealed that boys who smoke obtain lower marks in their subjects than do boys who do not smoke. Nonsmokers, on the average, are better students than are smokers. This fact has been interpreted as indicating that smoking affects the interest and learning capacity of boys to such a degree that their scholarship suffers appreciably. The interpretation would be justifiable if the smoker and nonsmoker were the same in every respect except for the smoking, but this is not the case. The facts are that schoolboys who are nonsmokers have, in the main, higher I.Q.'s, come from better homes, and show fewer behavior-problem tendencies. The smokers and nonsmokers are different in traits and characteristics that influence scholarship, so that the difference in school achievement cannot be attributed to the use of tobacco. It happens

that the pupils who smoke are those who have the least aptitude for schoolwork. This has been the case in the past. If more schoolboys take up smoking, the difference will be less marked.

Conceivably, smoking may have some effect on the learning ability of school children, but we cannot conclude that this is the case from the findings that smokers and nonsmokers differ in their scholarship. The effect of tobacco on learning ability can be determined experimentally by testing the mental efficiency of persons during the periods when they smoke and when they do not or, better yet, by measuring the achievement of two equal groups of which the members of one group smoke, whereas the members of the other do not. In the experiment, all factors that influence learning ability must be the same, and the only variable, or differing, factor must be the smoking.

Studies that have been made to measure the effect of tobacco indicate that smoking does have a slight tendency to reduce mental efficiency. Not all who smoke manifest such a reduction, but the general trend is slightly downward. The physiological effects are more pronounced than the mental effects. The heartbeat is stimulated; steadiness is decreased; and the powers of motor coordination are weakened.

Evidence indicates that smoking has an effect on mental and physical efficiency. We are fairly certain that it does not improve either. Of one fact we are certain, and that is that for everyone except the very rare exceptions there are no benefits to be obtained from smoking; but, instead, some slight injury to health and efficiency probably results. However, anyone who associates the use of tobacco with intellectual bankruptcy has a distorted point of view. Every day observation shows that much mental work is being done by men who are habitual and, in some cases, heavy smokers. Some of the most capable college students are smokers, while some of the poorest are not. The use of tobacco does not reduce mental efficiency materially, or we should not see so many smokers among the great scientists and authors.

Most experiments of this sort have included adults as subjects. Probably the effect on growing children would be greater. The use of tobacco has been interpreted in terms of its influence on mental efficiency. In appraising it fully, it should also be evaluated for its effect on health; as an expense; as pleasure or annoyance; and also as a time-consuming, ill-smelling, and unclean habit. These points are outside the present study but are mentioned in order to suggest a wider orientation to this as well as to attempt to train the student to see problems fully, with all their ramifications.

Alcohol and Efficiency. We need no experiment to provide data on what large dosages of alcohol do to mental and physical efficiency. Almost everyone has heard the incoherent words of a person who has drunk heavily or has seen such a person stagger about or lie on the floor. The evidence is fairly clear that, in cases of intoxication, mental and physical abilities are seriously impaired.

Even though larger amounts of alcohol deaden and anesthetize the senses, it is conceivable that small amounts may stimulate the human organism and improve the facility with which it learns. There are those who insist that even a little alcohol reduces the mental and physical powers; others maintain that moderate and restricted drinking improves the abilities to respond to a situation. The only satisfactory answer to the question is to be found in carefully conducted experiments.

One such experiment, conducted by Hollingworth, will be discussed. Tests of mental ability included multiplying two-place numbers by each other, finding the opposites of a list of adjectives, and learning to make substitutions involving letters and geometrical forms. Steadiness was measured by testing the ability to hold a small steel pointer in a hole without touching its edge. Coordination was measured by the persons being tested having to make contact with the metal inserts in a wooden triangle; those who could go around the triangle most often by making contact at each corner were considered as having greater powers of coordination. In a tapping test the subjects tapped a metal plate with a metal pointer as fast as they could, and the number of taps was recorded electrically.

The young men who were subjects in this experiment were examined by these tests under a number of circumstances: when they did no drinking, when they drank a considerable amount of water, when they drank beer that contained no alcohol, when they drank about three bottles of 2.75 beer, when they drank six to nine bottles of 2.75 beer, and when they ate a heavy noon meal. They were in the laboratory a number of days from nine o'clock to four. The drinking or eating was done at noon, and the record on the tests during the morning was compared with the afternoon's record in order to test the effect of alcohol on mental ability, steadiness, and coordination.

The results indicated that efficiency was decreased by the alcohol. The decrease was largest during those afternoons following the heaviest drinking, being about 10 to 15 per cent for the mental functions; the loss was only about 5 to 10 per cent during the afternoon following the noon of light drinking. The greatest effect was on steadiness; there

was considerable unsteadiness when much beer was drunk. The losses of ability measured by the coordination and tapping tests were essentially the same as the losses in the mental functions and corresponded to the amount of alcohol consumed. It is rather difficult to interpret percentages psychologically; but, in general, it may be concluded that the drinking of comparatively weak beer lowered mental and physical efficiency a little; furthermore, as the amount of alcohol consumed was increased, mental and physical efficiency was further decreased.

Some of the more specific results of the experiment were that toward the end of the afternoon period, which ended at 4 P.M., efficiency was being regained because the effect of the alcohol was wearing off. It was also discovered that individual resistance to the effects of alcohol varied according to abilities. In general, those of the highest mental and physical capacity were influenced least by the alcohol, and those least capable were affected most. This is consistent with the general principle that good influences favor most those who are best and favor least those who are poorest originally, or that unfavorable influences affect least the most favored and most those who are least endowed. Another observation made in connection with the Hollingworth study noted that efficiency may be maintained quite well if the subject is highly motivated or fights off the effects that lower it. In other words, if one does not "let go," the injurious effects are much less marked.

This principle also applies to fatigue, pain, distraction, and uncomfortable weather conditions. If a person fights off their effect, the loss of efficiency is much less. It should be emphasized, however, that any prolonged attempt to defeat fatigue or to stimulate efficiency by artificial means, as by drugs, can end only in ultimate loss of efficiency. Possibly for a short period, as in an emergency when one must accomplish much in a short time, one might fight off the effects of fatigue and stimulate efficiency artificially. The aftereffects, however, are not good, and in the long run the net result will be less accomplishment than if one works an optimum amount from day to day.

Alcohol is commonly regarded as a stimulant, while in fact it is a sedative. It gives the impression of being a stimulant because it tends to make people talkative. Alcohol relaxes a person and reduces his inhibitions, and consequently his talkativeness is stimulated. The quality of the talking is not improved; only the quantity is increased.

Not all persons react in the same way to varying sized doses of alcohol; but, in general, efficiency in all activities and processes, either simple or complex, is lowered by alcohol. Tapping rate, reaction time, typing, reading, automobile driving, and answering mental-test ques-

tions are all affected adversely by alcohol. It does not stimulate more rapid and more accurate responses but has the opposite effect.

Caffeine, Strychnine, and "Pep Pills." These are stimulants, and, in general, temporarily improve mental function and sensorimotor abilities. Caffeine is usually associated with tea and coffee, for these beverages contain it to the extent of about two to three grains per cup. Amounts of caffeine ranging from the amount in a cup of tea or coffee to three times as much have been used to test its effect on mental and physical abilities. The effect on typewriting, for instance, was found to vary according to the size of the dose. Small doses not exceeding three grains increase the speed, and accuracy is not impaired; but larger doses, between three and six grains, retard both speed and accuracy.

Small doses of caffeine also stimulate the mental processes. The effect is noticeable about an hour after the drug is taken and persists for several hours. Larger doses persist longer than smaller ones. Apparently no negative reaction from the stimulating effect on efficiency follows the period of stimulation from small doses; but when large doses of caffeine are used, the efficiency drops below average when the stimulating effect has worn off.

The effects of one or two cups of coffee are to decrease the pulse rate about 5 to 10 per cent and to increase blood pressure about 5 per cent. Memory is improved slightly, as is the rate of adding, and this supports most findings to the effect that caffeine stimulates the higher mental processes. The evidence indicates that caffeine or coffee and tea reduce boredom and sleepiness and tend to stimulate "peppiness" and attentiveness.

Not much need be said about strychnine except that certain dosages may increase efficiency temporarily; the aftereffects are reduced efficiency. Strychnine is a dangerous poison and should be administered only by a competent physician.

"Pep pills" are sometimes taken by college students, particularly when they are cramming for their examinations. These pills contain benzedrine sulphate, and they keep a student awake so that he can study for longer hours than usual. "Pep pills" are effective for this purpose, but their use is not to be recommended, for their physiological aftereffects, namely, headache, fatigue, sleeplessness, and poor circulation, are bad.

The reactions of people to benzedrine sulphate or similar drugs are not uniform. The largest number feel "peppy," stimulated, and exhilarated. They also feel that their powers of concentration have been increased. On the other hand, a considerable number complain of

insomnia and nervousness. A few complain of headache, uneasiness, and increased fatigue. For most people, "pep pills" lessen sleepiness and cause greater alertness, but some respond to them with increased fatigue and depression.

The use of drugs to increase mental and physical powers results, in the end, in lowered efficiency. It is true that, when a person is depressed and apparently without energy, some drugs can be taken that cause a temporary feeling of exhilaration and renewed energy. They also prevent sleepiness. Thus, if a person must drive an automobile all night or be active in an emergency, he can improve his powers temporarily; but, in general, efficiency can be maintained best by a sensible regimen of work, rest, recreation, and diet and by observing the established psychological principles of learning.

The effects of benzedrine sulphate on mental and physical efficiency have been tested. In general, it has been found that the mind is more alert and thinks better as a result of being stimulated by "pep pills" of this drug. The same is true of the speed and accuracy of physical reactions. Some persons are affected adversely by this stimulant, but, on the whole, it improves the mood and feeling tone and tends to reduce fatigue. The aftereffects, however, probably more than offset the advantages gained.

THE EFFECT OF HUMIDITY AND TEMPERATURE ON ACHIEVEMENT

Teachers and school administrators lay great stress on the temperature of the schoolroom and the humidity of the air. Today, air conditioning has become an important industry, and the public is "air-conditioned-minded." Educators are interested in temperature and humidity primarily because they are thinking of the health of students and secondarily because they feel that, unless the temperature and humidity are nearly ideal, learning ability is impaired.

The ideal temperature is generally considered to be about 70 to 72 degrees and the proper relative humidity approximately 50 per cent. It is usually assumed that students work best under such conditions; but measurement of mental performance when the temperature and humidity are unduly high indicates that one can do just as well at such times as when these two factors are ideal. In a study of mental ability the subjects were tested in a poorly aired room where the temperature was 86 degrees and the relative humidity was 80 per cent. The test consisted of problems in mental multiplication and in finding words opposite in meaning to given words. The subjects were tested

for 4 hours each day on five consecutive days. They were also tested when the room was well aired, the temperature was 68 degrees, and the relative humidity 50 per cent. No essential difference was noted in the mental efficiency of the subjects in the two situations.

These results suggest that for a period of several hours, at any rate, human beings can adjust themselves to unfavorable climatic conditions and maintain their efficiency. Probably, if high temperatures and humidity were maintained for much longer periods, mental efficiency would finally be impaired, just as it is in the latter part of a long period of sleeplessness. Conceivably, then, efficiency may be maintained for a time when atmospheric conditions are not favorable, but a depressing and enervating effect would set in after a prolonged period.

High temperature and high humidity actually do reduce efficiency. It is true that for a short period a person can make a special effort and resist the unfavorable effects, but this in itself is fairly good evidence that high temperatures and high humidity reduce efficiency.

Poffenberger reports that in two unventilated factories the output was 11 and 18 per cent less in the hottest weeks of the year than in the coldest. In ventilated factories the output was only 8 per cent less in the warmest weeks than in the coldest. Such facts are reliable evidence that comfortable and healthful temperatures and humidity are conducive to greater efficiency.

It is known from general observation that in geographical areas where the temperatures and humidity are high throughout much of the year the intellectual productivity and creativeness of the people are low. The products of great energy and creativeness, such as achievements in art, letters, and science, are given the world principally by men and women in the temperate zones, where the climate is cold a portion of the time and never very hot and humid for a large part of the year. Statements such as these are not proof that high temperatures and high humidity affect mental efficiency, for possibly men with potential creativeness are attracted to the temperate zones by the greater opportunities there in industry, science, and art. These selective factors should always be considered. However, examples are on record of young men charged with ambition to do research and to publish their findings who after residing for a time in a warm, moist climate have lost much of their interest and are no longer creative.

Experiments show that for a short period one can by determination overcome the enervating, debilitating effects of poor ventilation and unhealthy temperatures. But on the basis of broad experience and observation such conditions apparently influence efficiency eventually.

The work accomplished under experimental conditions is hardly what will be done in the typical classroom. Teachers and administrators are wise, therefore, in regulating the temperature and humidity so that the room conditions are pleasant and comfortable. In general, if the room is kept free from drafts and the temperature and humidity are maintained at a comfortable level, the children will be happier even if not materially more efficient; in the long run, they probably will be considerably more efficient, also.

SUMMARY AND REVIEW

From the beginning of the school day to its end there is little change in actual efficiency. The first and last periods are the least efficient, probably because they are the warm-up and terminal periods. Any changes in efficiency throughout the day are caused, not by fatigue, but most probably by changes in interest.

In preparing the daily program no consideration need be given to the "hardness" of subjects, though consideration may be given to the factors of activity, variety, and interest.

In a pioneer experiment by Miss Arai over a period of 11 hours, actual efficiency was reduced about 50 per cent, but when the task was changed the loss of efficiency was reduced to only one-fourth as much, thus showing how a change of tasks contributes to efficiency.

There is no close correspondence between a feeling of fatigue and actual fatigue; therefore, a feeling of tiredness may be misleading. Consequently, a person should not give in to the first feelings of fatigue.

Over a period of 60 to 100 hours of sleeplessness there develops a marked loss in efficiency. This can be largely restored by a 10-hour sleep, although the effects of sleeplessness extending to 100 hours are felt for several days.

Adequate sleep, recreation, and wholesome diet, in short, healthful living, should be experienced in order to avoid fatigue and to maintain maximum efficiency. Monotony of body position or of activity should be avoided, as well as tiring noise and light. Fatigue is often induced by worry, fear, and tensions, which sometimes result in breakdowns.

Tobacco (nicotine) tends to reduce mental and physical efficiency slightly, as do comparatively small doses of alcohol, which is a narcotic and not a stimulant as ordinarily thought. The amount of caffeine in a cup of coffee improves efficiency a little, but larger amounts may have negative effects. "Pep pills," or benzedrine sulphate pills, have in general a toning up effect and reduce sleeplessness, but the aftereffects

more than offset any gains. Some persons experience only adverse effects.

Even though pupils in a test situation can maintain their efficiency during an experimental period when the temperatures and humidity are uncomfortably high, other evidence indicates that efficiency is greater when the temperatures are comfortable.

In general, conditions of living should be comfortable and healthful, activities should be varied, and a person should observe a healthful regimen of sleep, recreation, eating, and work in order to maintain maximum efficiency. The use of alcohol, tobacco, and "pep pills" results in a net loss in efficiency.

Test Your Thinking

1. If a pupil is interested and tries hard, his efficiency varies little throughout the school day. Comment.
2. Discuss whether or not a feeling of fatigue is a reliable index to true fatigue.
3. In arranging the order in which subjects are to be studied in the course of the day in an elementary school, the interest of the pupils should be taken into account, rather than the hardness of the subjects. Discuss.
4. If a person started out in the morning to memorize poetry, to work arithmetic problems, or to translate German and continued in one of these activities diligently for 10 hours without interruption, there would probably be a true decline in efficiency of 25 to 50 per cent. Discuss whether or not the true decline is caused by actual fatigue.
5. What methods can be used to prevent a loss of interest and to minimize the possible effects of fatigue during the day?
6. What conclusions can you draw and what applications can you make from the findings on the effects of loss of sleep?
7. What can a person, child or adult, do to be in a condition that is conducive to efficiency?
8. How much advantage is possibly gained by not smoking?
9. What effect does a moderate drink now and then have on motor and mental efficiency?
10. What is the effect of drinking a cup of coffee on motor and mental efficiency?
11. For the majority, "pep pills" destroy sleepiness. What are the ill effects? Under what special circumstances might it be desirable to take a "pep pill"?
12. Even though a person be as attentive and as efficient when the temperature and humidity are high as when they are ideal, this takes much more energy and probably over a long period achievement will be less. Comment.

References

- ARAI, T.: Mental Fatigue, *Columbia University Contributions to Education* 54, 1912.
- BARMACK, J. E.: The Time of Administration and Some Effects of Two Grains of Alkaloid Caffeine, *Journal of Experimental Psychology*, 27: 690-698, 1940.
- BATES, R. L.: The Effects of Cigar and Cigarette Smoking on Certain Psychological and Physiological Functions, *Journal of Comparative Psychology*, 2: 371-424, 1922.
- BILLS, A. G.: Blocking—A New Principle of Mental Fatigue, *American Journal of Psychology*, 43: 230-245, 1931.
- BURNHAM, W. H.: The Effect of Tobacco on Mental Efficiency, *Pedagogical Seminary*, 24: 297-317, 1917.
- CARL, G. P., and W. D. TURNER: The Effects of Benzedrine Sulfate (Amphetamine Sulfate) on Performance in a Comprehensive Psychometric Examination, *Journal of Psychology*, 8: 165-216, 1939.
- CLARK, BRANT, and NEIL WARREN: A Photographic Study of Reading during a Sixty-five-hour Vigil, *Journal of Educational Psychology*, 31: 383-390, 1940.
- CLARK, HAROLD F.: The Effect of Diet on Learning, *School and Society*, 55: 128, 1942.
- EDWARDS, A. S.: Effects of the Loss of One Hundred Hours of Sleep, *American Journal of Psychology*, 54: 80-91, 1941.
- FISHER, V. E.: An Experimental Study of the Effects of Tobacco Smoking on Certain Psychophysical Functions, *Comparative Psychology Monograph* 4 (No. 19), 1927.
- GILLILAND, A. R., and DOROTHY NELSON: The Effects of Coffee on Certain Mental and Physiological Functions, *Journal of General Psychology*, 21: 339-348, 1939.
- HOLLINGWORTH, H. L.: The Influence of Alcohol, *Journal of Abnormal and Social Psychology*, 18: 204-237, 311-333, 1923-1924.
- HOLLINGWORTH, H. L.: The Influence of Caffeine on Mental and Motor Efficiency, *Archives of Psychology* 3 (No. 22), 1912.
- HULL, C. L.: The Influence of Caffeine and Other Factors on Certain Phenomena of Rote Learning, *Journal of General Psychology*, 13: 249-274, 1935.
- HULL, C. L.: The Influence of Tobacco Smoking on Mental and Motor Efficiency, *Psychological Review Monograph* 33 (No. 150), 1924.
- MEAD, LEONARD C.: The Effects of Alcohol on Two Performances of Different Intellectual Complexity, 21: 3-23, 1939.
- NOLL, V. H.: A Study of Fatigue in Three Hour College Ability Tests, *Journal of Applied Psychology*, 16: 175-183, 1932.
- POFFENBERGER, A. T.: Effects of Continuous Work upon Output and Feelings, *Journal of Applied Psychology*, 12: 459-467, 1928.
- POFFENBERGER, A. T.: Effect of Drugs on Mental Efficiency, The Effects of Strychnine on Mental and Motor Efficiency, *American Journal of Psychology*, 25: 82-120, 1914.

- REIFENSTEIN, Edward C., Jr., and EUGENE DAVIDOFF: Psychological Effects of Benzedrine Sulfate, *American Journal of Psychology* 52: 56-64, 1939.
- ROBINSON, EDWARD S., and SAMUEL O. HERRMANN: Effects of Loss of Sleep, *Journal of Experimental Psychology*, 5: 19-33, 1922.
- STAINER, W. J.: Rate of Work in Schools, *British Journal of Psychology*, 19: 439-451, 1929.
- THORNDIKE, E. L., W. A. McCALL, and J. C. CHAPMAN: Ventilation in Relation to Mental Work, *Teachers College Contributions to Education* 78, 1916.
- VALENTINER, H. L.: The Comparative Fatigability of Normal and Mentally Deficient Children, *Journal of Abnormal and Social Psychology*, 36: 51-61, 1941.

CHAPTER XIX

THE ACTIVITY AND PROJECT METHOD OF TEACHING— INFORMAL AND INCIDENTAL LEARNING

What to Look For. Distinguish between the activity, project, or progressive method and the traditional method. What terms distinguish these two methods?

Note the claims that are usually made for each method.

What were the results of one of the early experiments on the effectiveness of the activity method, and why can the results be questioned?

Learn the features of the Collins experiment with the project experiment, and learn how the results were evaluated.

How can arithmetic be taught by the activity method, and what are both the immediate and the more remote results of such methods of teaching?

What were the results of trying to teach English by means of a puppet show?

Is the material covered when taught by the informal, activity, or project method?

Give your reactions to the policy of postponing formal arithmetic for several grades instead of beginning it in the first or second grade.

An experiment was conducted that is referred to as the Thirty Progressive Schools. Learn the features of the experiment and the results.

Note that not all the results are on the side of the more modern methods.

Give consideration to the relationships of the traditional and progressive methods of teaching and American democracy. Which is more in harmony with our philosophy of government?

What are the results obtained from the new and old methods in terms of subject matter and personal development?

Introduction. Methods of teaching range from the rigorous question-and-answer, textbook, and drill method to the project and purposing type of teaching. The former makes little appeal to motive and is not based on an activity program; the latter is based on problems, purposes, and motives.

Controversy has raged for many years over the comparative effectiveness of the older and newer types of teaching. The experimental

evidence is not one-sided, with all of it supporting one type of method. Some evidence indicates that pupils taught through drill and reviews, with emphasis on the acquisition of facts, do better in examinations designed to measure the extent to which facts have been acquired. Progressive educators insist that education consists of much more than the acquisition of facts and even that, besides acquiring many other values, children actually learn more facts under the project, activity, and purposing method than under the more traditional type of teaching.

Teachers and administrators today are deeply interested in the activity, or project, method of teaching. This movement is at present attracting the interest of educators as hardly ever before. Leaders are arguing heatedly, and even bitterly, over its merits and demerits. We have the "progressives," on the one hand, advocating this method of teaching and sponsoring experiments; on the other, we have the "conservatives," or "essentialists," denouncing some features of it and pointing out the virtues of the more formal methods.

In the public press, because of the results obtained from history tests given to high-school graduates a few years ago, a torrent of editorial criticism was poured out against the schools. The apparent lack of knowledge was caused, it was claimed, by progressive methods of teaching. We were told to get back to teaching the good old fundamentals in the good old-fashioned way. Whatever progress the country had made in going to the dogs, and it seemed to be a good deal, was laid at the uncertain feet of progressive education, with its activities, projects, and purposes.

Even though it has not been and is not a prevailing method, the activity method of teaching is not new. It is probably as old as teaching itself. Some teachers have always taught by means of controlled activities and larger units. There have also been philosophers throughout the ages who have expressed disapproval of the rigorous, formal, lock-step type of teaching and advocated a more liberalized method based on the pupils' normal interests and activities.

Some fundamental differences exist between the more common traditional type of teaching and the newer methods that have been designated as *activity methods*. The traditional method is more formal and systematic. The work is divided into definite courses, or subjects. Lessons are assigned, and formal recitations and examinations are considered very important. The program is carefully planned and diligently followed, with a specific time and place for each subject. Drill, review, and systematic study are stressed, and such terms as *thoroughness, mastery, habit, skill, and knowledge* are used to describe the objectives

and outcomes. The teacher is conspicuously in control, and the work usually centers in the content of textbooks.

The activity school is less formal and lays stress on activities and projects that are lifelike and appeal to the pupils' natural interests. The teacher is in control but less conspicuously so, being less master than in the traditional schools and more guide and helper. During the course of the school day the students are engaged in units of work, and in projects, and take excursions; and the aim is to acquire abilities, knowledge, and skills through these projects and activities instead of reading assigned pages in a text or working the next 10 problems in an arithmetic assignment. Students under the activity method will have a school garden; do school banking; audit school accounts; and, through series of units and activities, gain the skills and abilities that are acquired more directly in the formal study stressed in the more traditional school.

In the philosophy of the activity school, terminology is quite different from that of the traditional school. Instead of stressing drill, thoroughness, and discipline, the terms employed are *interest*, *purpose*, *attitude*, *learning in a natural situation*, and *learning psychologically* rather than *logically*. Exponents of the activity method state that education is much more than acquisition of facts and skills and is more concerned with the development of interests, initiative, the desire to learn, and personal qualities conducive to living successfully with one's fellow man.

Those who attack the activity school usually claim that the children it educates do not acquire the fundamental abilities that almost everyone agrees are essential. They insist that the activity, or project, methods are largely hit-or-miss and leave too much of the control to students too immature for such responsibility. Students' own interests are not a safe guide to follow, according to those who favor the more formal type of teaching. As a net consequence, the work is indefinite and often chaotic, and the students do not learn the subject matter.

The sponsors of the activity movement state, however, that their students learn as much, and probably more, subject matter and that they gain many intangible values not acquired in the usual schoolroom. They point out that, in spite of the drills, reviews, questions, and answers of the traditional school, many students fail to learn effectively. They also mention that students of the activity school actually acquire more information and have more knowledge than students in schools laying the greatest stress on such acquisition and also that the interests, needs, and wishes of children are observed to a greater extent than in

the more conventional type of school. Furthermore, those of the activity school maintain that much of the learning in the typical school is artificial and not lifelike to the child but largely rote and mechanical. On the other hand, when a child learns through activities and projects, he acquires his skills and knowledge from a natural problem and in a life-like situation. Consequently, the work of the school has meaning to him because it is real and vivid.

These issues are fundamental, for they pertain to the learning and living of the school child. Since the principal purpose of the teacher is to guide the pupil to learn effectively and to live successfully, these issues are also vital to the student of educational psychology.

The major purpose in discussing the activity, purposing, or project methods is not to argue for its effectiveness but to show that these methods provide additional means for stimulating learning, for developing personality, and for providing for individual differences. These more modern educational methods enlarge our concepts of learning, and the educator should have an experimental attitude toward any method that will develop the students. Furthermore, no given principle of learning or educational method has a monopoly on effectiveness. It is thus best to enrich the experiences of the students as far as possible by utilizing all accepted methods.

EXPERIMENTAL RESULTS

An Early Experiment. Even as far back as over 30 years ago, a report was made of a grade school in which the students did not study arithmetic, grammar, history, and the other traditional subjects but instead learned through activities, which consisted of observation, games, handwork, stories, pictures, and music. The pupils thus taught were studied when they had become high-school students, and it was then discovered that they did better on the average than students taught in the usual way. This, of course, does not prove the superiority of the activity method, for the students from the activity school may have been superior in capacity and consequently might have done superior work regardless of the method employed in teaching them. Nevertheless, the report of this work is important in showing that the activity type of teaching and the project method do not belong exclusively to this decade.

Results in Various Areas. One of the more extensive studies of the project method was made in Missouri in a rural-school situation. Three rural schools were included. One, known as the *experimental school*, had an enrollment of 41; two others, known as the *control schools*, had enroll-

ments of 29 and 31, respectively. Over a period of 4 years the project and activity program predominated in the experimental school; in the control schools the traditional methods prevailed; the object of the experiment was to test the effectiveness of the method stressing purposes and motivation.

In the experimental school the day was devoted to four types of project—story, hand, play, and excursion. The investigator's words describe these projects¹:

Play projects represent those experiences in which the purpose is to engage in such group activities as games, folk dancing, dramatization, or social parties. Excursion projects involve purposeful study of problems connected with environments and activities of people. Story projects include purposes to enjoy the story in its various forms—oral, song, picture, phonograph, or piano. Hand projects represent purposes to express ideas in concrete form—to make a rabbit trap, to prepare cocoa for the school luncheon, or to grow cantaloupes.

The teachers in the experimental school tried to stimulate situations so that these various types of projects grew naturally out of lifelike experiences. For example, the children studied the causes of frequent typhoid fever in the home of Mr. Smith, one of the residents of the school district. They made visits, wrote for bulletins, made flytraps, and prepared reports. This project caused them to do considerable reading, reporting, and writing; they found use for arithmetic in calculating costs for window screens and flytraps; and they also had experience in manual training. Thus, as a part of their motivated activity, they received excellent training in oral and written English, arithmetic, manual arts, and sanitation and hygiene. Because they actually studied a real problem and made real recommendations to Mr. Smith on how to avoid typhoid fever, the pupils also developed definite ideals and attitudes toward hygienic and sanitary living.

Many other projects grew out of their immediate environment, such as how Mr. Long made molasses, how the dandelion spreads so rapidly, how tomatoes were canned at the local factory, what was seen at the big circus and at a trial in a juvenile court, and how the county agent tested soil. Out of such projects the grade pupils of this experimental school were expected to obtain the knowledge and skills that are expected to be achieved through the traditional curricula. The exponents of the project method maintain that out of the children's rich experiences they acquire certain ideals and appreciations which probably are more

¹ COLLINGS, ELLSWORTH, *An Experiment with a Project Curriculum*, p. 48, The Macmillan Company, New York, 1926.

significant to them than are the facts and information that they learn.

The experimental and control schools, which had been matched at the beginning so that valid comparisons could be made at the end of the experimental period, were tested to determine the effectiveness of the project method. The pupils were tested in penmanship, composition, spelling, American history, geography, reading, and the four fundamental processes in arithmetic. The achievement of the students in the experimental school was 138.1 per cent of that of the control school. There is always a danger of fallaciously expressing relative achievement by means of percentages; nevertheless, the results indicated a definite superiority in knowledge and skills of the children taught by the project method.

Apparently, when children are motivated in the study of real and lifelike problems and projects, they acquire more subject matter than do those who study just the teacher's daily assignments. In order to answer their own questions and to solve their problems, pupils of the project method studied in the various subject-matter fields extensively enough to achieve better than those who studied only the "next lesson."

In addition, the attitudes of both pupils and parents toward the school were investigated. That of the pupils was evaluated by calculating changes in attendance, tardiness, truancy, corporal punishment, graduation from the eighth grade, and the number entering high school. In all these items, distinct superiority existed for the experimental school. For example, 85 per cent of the pupils of the experimental school graduated from the eighth grade, whereas only 10 per cent of the control-school pupils did so.

The parents' attitudes were judged by the number of their visits to the school, attendance at annual school meetings, tax rate for teachers' salaries, use of school apparatus and school library, and votes for establishment of a rural high school. All items were decidedly in favor of the school using the project method. For example, the change in the number of parents visiting school was 90 per cent in the experimental school and 5 per cent for the control.

The evidence from this experiment by Collings is convincing that a type of schoolwork which is motivated and has a purpose felt by the students results in outcomes favorable in terms of both subject matter and attitudes. Mention might be made of the fact that, when the effectiveness of any program of teaching or supervision is tested, improved results are usually obtained. This improvement comes about

because the experiment causes increased efforts on the part of teachers and supervisors. The experimental program takes on the character of a drive, or campaign, to improve achievement. And experience has shown that achievement can be stimulated when special effort is directed to that end.

Thus, when a method of teaching is tested by experiment, in a sense one is testing also the special effort that takes place when an experiment is preceded and followed by testing. When a method is being tested, more zealousness is devoted to making the method effective. Nevertheless, an experiment testing the results of a project and activity type of teaching gives some evidence on the effectiveness of motives and interests that are developed through this method of teaching.

Results in Arithmetic. The discussion of the activity method can be continued by describing the experiences of Harap and Mapes when they taught decimals through an activity program instead of in the usual way. Instead of assigning specific problems and drilling on certain facts and principles, they attempted to bring about acquisition and comprehension by means of 13 units of work. These units comprised the year's work and were as follows: (1) school banking; (2) keeping spelling records; (3) community fund; (4) using milk; (5) making tooth powder; (6) school fund; (7) making furniture polish; (8) making ink; (9) making hand lotion; (10) making paste; (11) making *glacé* apples; (12) making presents for mother; (13) making a garden. Through these activities, it was anticipated that the students would acquire a superior knowledge of decimals; the reader can easily see that these activities call for such a knowledge. For example, in making furniture polish the pupils divided and combined various quantities of liquids, such as alcohol, linseed oil, and turpentine, in order to obtain 4-ounce portions of polish. Thus, according to the theory of the activity movement, they learned to understand decimals by making furniture polish and also by engaging in the other activities designed to call into need and practice the use of decimals.

In this experiment, there were an experimental and a control group, and both initial and final tests were given to determine the gain in knowledge over the year's period. The experimental group was taught by means of the units and activities enumerated above; the control group, in the usual way. Results indicated that in 27 basic processes the pupils of the activity program gained a mastery of 96 per cent and that the control group, taught in the conventional way, achieved a mastery of 67 per cent. Thus, on the grounds where the activity movement is

most severely attacked, the results in this experiment, at least, show that certain narrow and technical skills can be acquired effectively through projects and activities.

Probably of greater importance are the results of the retests given a year after the final tests of the experiment. The pupils of the activity program showed even greater ability than they had at the end of the year's work, indicating that the ability was not only retained but even increased. This is the point emphasized by the exponents of the project method. They state that the skills and abilities acquired in working on real and interesting problems will be retained better because of being learned through use and practice in a situation where the pupils are highly motivated. Knowledge and ability acquired in this way, they claim, will be retained, for it is learned psychologically in a real situation where many rich associations are developed. These educators state that, on the other hand, knowledge acquired by rote and by teacher-assigned lessons will be largely forgotten, since the subject matter has not the real meaning that it has when learned through activities and experiences. It is contended that true and real meaning is achieved through vivid activities and is not acquired by means of the mechanical and routine procedures of the old-style teaching.

Other experiments also indicate that pupils taught according to the activity method learn very effectively. In one study the activities consisted of a candy sale, mothers' party, preparing baskets for needy families, preparing a luncheon, making quilts for children's hospitals, and serving the teacher's luncheon. Each of these units took 8 to 12 periods; the purpose was to test whether or not the pupils learned the fundamental processes. Of the 17 processes tested, 14.2 steps, or 84 per cent of them, were mastered. The period covered was half a grade, or $\frac{1}{2}$ year; and an analysis of the examination showed that 79.5 per cent of the basic steps were mastered during that period. The pupils had comparatively little arithmetical ability in the beginning; they acquired most of it during the experimental period.

It did not matter whether the steps appeared logically or in random order; the students learned them just as well one way as another. Furthermore, no correlation existed between the number of times the process was repeated and the degree of mastery; the results in general show that all the processes were acquired to a satisfactory degree.

These results cast doubt on the idea that in teaching arithmetic the steps must follow in logical order and textbooks should make regular provision for consistent review and repetition. Conceivably, if a step is experienced in a problem or activity situation, the usual principles of

exercise and repetition do not hold. We have learned that principles of learning through practice and repetition do not hold in many instances and apparently have been oversimplified.

Results in English and Language. Additional evidence on the effectiveness of the activity method was obtained for a semester's work of a fifth-grade class, the activity consisting in writing and presenting a puppet show. The pupils gave the show in order to earn money to buy library books, and they made \$26. They studied the history of puppetry in Greece, China, Japan, Italy, India, England, and the United States. They read many books in order to obtain suitable material for the construction of their show. Some of these were Hans Andersen's *Fairy Tales*, Lewis Carroll's *Alice's Adventures in Wonderland*, and Daniel Defoe's *Robinson Crusoe*. Oral English was practiced in committee meetings, in the discussion of plans, in telling visitors about the show and how puppets are made, in talking to shopkeepers in making purchases, and in reading parts in the play. Practice in written English was obtained by writing the play, recording experiences, and writing letters to business concerns about needed materials, advertisements, letters of invitation, and critical reviews. Activities were not confined to English alone, however. The pupils also had to figure the cost of materials, to sew, to paint, and to do carpentry work. Moreover, they derived valuable social experiences from working together, from meeting visitors, and from going to the library.

In this experiment, no control group was used, but tests were given to determine the gains acquired, and comparisons were made with the standards. The percentage of normal, or average, gain in reading vocabulary was 156 per cent; in reading composition, 163 per cent; in language usage, 163 per cent. Thus, the gains in fundamental skills were about $1\frac{1}{2}$ times the average, and probably most important were the gains from experiences outside the field of English.

Covering the Material. Teachers accustomed only to the usual classroom procedures doubt that the pupils will have an opportunity to acquire fundamental skills and knowledge unless they are taught in a regular and systematic way. Usually they ask, "How can a child get his concept of numbers and acquire practice in the fundamental process and also in reasoning unless he acquires skills and abilities through formal drill?" They do not realize that a method can exist outside the regular drill-and-assignment, textbook method.

Nothing is further from experience than this assumption, however, as students from kindergarten through graduate school learn by means of problems and activities that cause them to acquire many facts and

develop new ideas. In fact, in the graduate school a student learns largely through working on problems and conducting research. In the kindergarten, children can learn arithmetic by using the calendar and raising questions about various days, by keeping attendance charts, by keeping track of vacation days, and by holding parties for their mothers. Any number of situations arise where children attending school can learn numerals and ordinals much more effectively than through formal drill and teaching.

In this connection, reference may be made to a study conducted to determine the origin of activities and the courses or subjects involved. Teachers of Berkeley, Calif., were asked to indicate the subjects in which activities originated; those which became involved, in addition to those in which the project originated; the length of time covered by the activity; and whether the activity was initiated by the pupils or by the teachers. Other points were covered, also. It was found that most activities originated in the social studies, about one-fourth as many in reading, and nearly the same number in nature study as in reading. Thus, it is apparent that far more activities originate in the social studies and fewer in the others.

Of the subjects which became involved but in which the activity did not originate, art was involved most often, with reading and language nearly as often, and spelling only one-half as often as art. Other subjects were included less often than spelling.

Activities vary considerably in their length, some taking a whole semester, others 8 weeks, some 4, and others a still shorter time. It is quite apparent, therefore, that activities fit into some fields of study better than others. Possibly it is not safe for all teachers to depend on activities to cover all the so-called *fundamental* subject matter. The proponents of the activity movement, however, might argue that the curriculum should not be divided into subjects and that projects and activities that disregard subject-matter lines will cover all fields of learning in the elementary school very adequately.

Another analysis of whether or not the processes are covered by activities was made to see how many involved the adding of tenths, hundredths, thousandths, and various mixed decimals. It was evident from this analysis that most of the steps involving the processes mentioned and also various combinations of decimals used in multiplication, subtraction, addition, and division were used. In one unit, for example, 34 out of 47 steps were practiced; in another, 26 out of 47. It appears, therefore, that if several activities or projects are carried out, practically all the steps will be covered.

Postponing Formal Arithmetic. One of the most fascinating experiments reported in the literature is one pertaining to the examination of pupils in arithmetic and the subsequent postponement of formal arithmetic until the seventh grade. This experiment was not scientific in the usual sense, for it had no control and experimental group; nevertheless, it is so provocative of ideas that it is worth detailed consideration. Benezet was disturbed by the large number of failures in the first grade accountable to arithmetic; also, he was appalled by the answers that eighth-grade pupils gave to his questions. A stenographer reported the replies. To a question about fractions, some of the replies were as follows:

1. The smaller number in fractions is always the largest.
2. If the numerators are both the same, and the denominators one is smaller than one, the one that is the smaller is the larger.
3. The denominator that is smallest is the largest.
4. If you have two fractions and the one fraction has the smallest number at the bottom, it is cut into pieces, and one has more pieces. If the two fractions are equal, the bottom number was smaller than what the other one in the other fraction. The smallest one has the largest number of pieces—would have the smallest number of pieces, but they would be larger than what the ones that were cut into more pieces.

The English used by the pupils was astounding; the knowledge of arithmetic was no better. As a consequence, Benezet stated that he "abandoned all formal instruction in arithmetic below the seventh grade and concentrated on teaching the children to read, to reason, and to recite—my new three R's!"

The new plan was carried out where the parents did not speak English; if it had been tried in schools where the children's parents were high-school and college graduates, there might have been a revolution. "Educated" parents would not have permitted such a drastic change in the school program, but the foreign-speaking were less sensitive. In the first six grades the program was informal but directed to give students quantitative concepts and to stimulate quantitative thinking. In the first grade, for example, the pupils learned the numbers up to 100 and such comparative terms as *more, less; many, few; higher, lower; taller, shorter*. In the second grade the comparatives were continued; but pupils learned also about how to tell time, page numbers, values of certain coins, and such simple measures as the pint and quart. The fourth grade did considerable estimating of dimensions in terms of inches, feet, and yards and of distances in terms of miles. In all this informal work an attempt was made to stimulate the students to reason

soundly, judge accurately, and comprehend matters realistically rather than mechanically.

As a general test exercise the members of both the conventional and the experimental classes were also asked to put down what they were inspired to write when a picture of a polar bear on a small iceberg was hung before them. It was Benezet's theory that formal arithmetic resulted in unimaginative statements and stifled the power of expression. He found that in the classes where the arithmetic was informal the pupils were distinctly superior in their use of adjectives. They used such words as *magnificent*, *awe-inspiring*, *unique*, and *majestic*, whereas the students in the classroom where the arithmetic was formal used such words as *nice* and *pretty*. Of course, this is not quantitative experimental proof, but it is a definite straw in the wind, showing possibly the direction in which the evidence points.

After a period of time the formal and informal classes were visited again and given a problem such as this: A wooden pole is stuck in the mud of a pond; one-half the pole is in the mud, two-thirds of the rest is in the water, and 1 foot is sticking out in the air; how long is the pole? In the traditional classrooms the answers were as incoherent as those of which samples have been presented here; figuratively speaking, the pupils themselves were stuck in the mud. On the other hand, the students in the classes where formal arithmetic was postponed to the upper grades figured out the answers without any difficulty; and when the answers of 5 years before were read to them, they shouted with laughter.

It can be argued, of course, that the type of arithmetic problem used is the old type, which is now out of date. In addition, as has been said before, claim may be made that the procedures were of an observational nature and did not involve carefully controlled measurements. This is true, of course; nevertheless, this type of study has considerable value because of the ideas that it emphasizes.

The 30 Progressive High Schools. An experiment was conducted by 30 high schools that broke away from the traditional by liberalizing their procedures. They adopted in various degrees the progressive, or activity, method. Their objectives were

1. To acquire fundamental knowledge, skill, and habits.
2. To develop good work habits.
3. To learn to think independently.
4. To acquire cultural interests and appreciations.
5. To adjust socially.
6. To be emotionally stable.

7. To be healthy.
8. To discover and develop fundamental purposes—vocational objective.

These are worthy objectives and much more comprehensive than the limited but often dominant objective of acquiring facts and information.

One of the major tests made of the effectiveness of the experimental program was the collection of evidence on how well the students from the experimental high schools did in college. Traditionally, many colleges require for entrance certain prescribed courses, but they waived the requirement for the students from the experimental schools. It is well that they did, for the students from the experimental schools got slightly higher marks than did the students of equal intelligence from the traditional high schools.

Of greater importance was the finding that, when a group of students was selected for capacity to do independent work, 75 per cent were students educated in the experimental high schools. In addition, research into the activities of the college students revealed that the experimental students were more interested in social problems and politics, had more dates, and attended more dances. Except for athletics, they were more active on the campus and exercised more leadership.

Academically, the experimental students were described as knowing how to search for facts and as having a tendency to base their opinions on the facts. They were also described as not being "grinds" but as being more dynamic than students educated in the traditional way.

In some instances the students from the experimental schools were handicapped. One discovered that his professor was not interested in his reading extensively, as he was accustomed to doing; instead, the professor's procedures called for memorizing the details of the textbook. A student in history discovered that his preparing an extensive bibliography and interpreting his wide reading did not fit the plans of another professor, who "wants me to take notes and give back to him what he has said." Of course, it is unfortunate that the students from the experimental schools had their good study habits upset in college by narrow teaching methods.

Different Factors and Results to Be Considered. Not all the evidence indicates that the project method of teaching is most effective. In the following investigation a nature-study project was used in grade 2A, an arithmetic project in grade 4A, and a geography project in grade 8A. Certain criteria were set up for projects, such as that the activity should be pupil-directed, that there was to be no drill, recitation, or review

in the conventional meaning of these terms, and that the teacher, in general, was to be a guide and counselor. The control groups were taught in the usual way, and tests were given to both groups to measure the achievement in the fields covered by the projects. The tests revealed that the control group was consistently ahead of the project group, having made gains more than twice as great and, in some instances, more than three times as great. The teachers felt, however, that the project, or activity, method aroused more interest, increased the amount of reading, stimulated more extensive oral expression, and made greater use of the pupil's personal experiences.

In evaluating the effectiveness of any teaching method in terms of what children learn, it should be kept in mind that the teachers who use the method are also being tested. It is possible that the teachers in some instances use one method much more effectively than another. Not because of any inherent advantages in the method, but rather because of the teachers' ability to use it, advantages are found for almost any method by its advocates. Those who are exponents of a system of teaching have a zeal for it that results in superior achievement. Therefore, in weighing the merits of any method, this factor should be taken into account in the final summing up.

Method, Philosophy, and Personal Development. In the traditional type of teaching the teacher is in charge, making the assignments, directing the students, drilling them, asking the questions, and laying much emphasis on examinations and marks. In many respects this method of teaching is autocratic in its nature and probably is not conducive to the best and fullest development of the student's personality. It is probable that curiosity, initiative, self-control, and leadership are not well developed by the traditional method of teaching.

The project, or activity, method, often called the progressive method, is more democratic and consequently in closer harmony with our political and social philosophy. It allows for the fullest development of the individual and takes into account individual differences in capacity, interests, and personality. There is evidence that students who are educated in schools where they have opportunity to plan and work cooperatively with their teachers and fellow students are better developed personally and get along better with each other. This is of the utmost importance. It is sound philosophically that in a democracy the methods in school should also be democratic. Otherwise, the school does not educate its students for the society in which they live.

General Results of the Activity and Nonactivity Methods. In general, students taught in activity schools acquire more knowledge

than do students of the traditional school. It seems also that the greatest advantages of the more modern methods lie in the qualities of independence, initiative, and enterprise that the students acquire. They acquire more competence in using the library and more specifically in using reference books, dictionaries, and glossaries. In general, they have more work-study skills. Usually they know how to interpret and apply facts better than pupils in the traditional classes.

Probably some of the greatest advantages lie in the personal qualities that students of activity schools acquire. They learn to work with their fellow students, planning their projects and developing them. Students work in groups, learning to give and take and exercising leadership in various phases of the work according to individual interest and capacity. It seems clear that all-round personal and intellectual development is better fostered in the activity school than in the traditional one.

SUMMARY AND REVIEW

The traditional method of teaching is formal in nature and concentrates on the students' mastering the subject matter. The activity, or project, method, also called the *progressive* method, is less formal and stresses learning in natural problem situations. The acquisition of subject matter is only one objective, the general objective being the full development of the individual.

Typical projects and activities are play, handwork, music, stories, excursions, and social activities.

Various experiments have been conducted to test the relative effectiveness of the more modern methods and the traditional methods. Such effectiveness is gauged by achievement tests and by evaluating the attitude of children and parents through the children's attendance, tardiness, truancy, and number graduating and continuing their education, and through visits to the schools by parents, their attendance at school meetings, and their willingness to support the schools. The effectiveness of the progressive methods in high school has been tested in terms of the performance of the graduates of such schools when they are college students—specifically, with respect to academic achievement, ability to work independently, leadership, and social activity.

Most results show that, when tested experimentally, the activity, project, or progressive method is effective from all standpoints. The subject-matter achievement is higher, and the students learn to work independently, are more active socially, and exercise more leadership. Not all results show superiority of the progressive method, but many of them do.

With the informal method, most of the work can be covered and achievement usually is above average. The point of view of the progressivists is that the most important outcomes are in the form of the personal and social development of the pupils.

Test Your Thinking

1. How do the progressive and traditional schools differ?
2. The effectiveness of the more modern, or progressive, methods has been tested. What have been the results in terms of acquiring subject matter? In terms of the development of work habits? In terms of attitudes? In terms of participation in extracurricular activities?
3. Some years ago progressive education was spanked frequently in the press for the failure of high-school graduates to know as much as was expected. Explain whether or not you think progressive education should be blamed, and give your reasons.
4. What would be the advantage of postponing the teaching of some school work until children were older than when taught this material now?
5. Describe what you conceive of as your ideal school.

References

- AIKEN, W. W.: *The Story of the Eight Year Study*, Harper & Brothers, New York, 1942.
- BENEZET, L. P.: The Story of an Experiment, *Journal of the National Education Association*, **24**: 241-244, 301-303, 1935; **25**: 7-8, 1936.
- BILLET, ROY O.: High School Pupils' Opinion of the Unit Plan, *School Review*, **40**: 17-32, 1932.
- CLARK, ELLA C.: An Experimental Evaluation of the School Excursion, *Journal of Experimental Education*, **12**: 10-19, 1943.
- COLLINGS, ELLSWORTH: *An Experiment with a Project Curriculum*, The Macmillan Company, New York, 1926.
- COLLINGS, ELLSWORTH: Learning the Fundamentals in an Activity Curriculum, *Journal of Experimental Education*, **1**: 309-315, 1933.
- CRAWFORD, C. C., and LILLIAN GRAY: Measured Results of Activity Teaching, *Journal of the National Education Association*, **20**: 270, 1931.
- DIEDERICH, P. B.: A Master List of Types of Pupil Activities, *Educational Research Bulletin*, **15**: 166-169, 1936.
- DROUGHT, N. E.: Measuring Success in College of Students from Experimental High Schools, *School Review*, **49**: 349-358, 1941.
- GEYER, D. L.: The Results of Activity Instruction: An Interpretation of Published Findings, *Journal of Educational Research*, **30**: 188-197, 1936.
- HARAP, HENRY, and CHARLOTTE E. MAPES: The Learning of Decimals in an Arithmetic Activity Program, *Journal of Educational Research*, **29**: 686-693, 1936.
- HARAP, HENRY, and CHARLOTTE E. MAPES: The Learning of the Fundamentals in an Arithmetic Program, *Elementary School Journal*, **34**: 515-526, 1934.

- HIZER, IRENE S., and HENRY HARAP: The Learning of Fundamentals in an Arithmetic Activity Course, *Educational Method*, 11: 536-539, 1932.
- JERSILD, A. T., R. L. THORNDIKE, B. GOLDMAN, J. W. WRIGHTSTONE, and J. J. LOFTUS: A Further Comparison of Pupils in "Activity" and Non-activity Schools, *Journal of Experimental Education*, 9: 303-309, 1941.
- LEONARD, J. P., and A. C. EURICH: *An Evaluation of Modern Education*, D. Appleton-Century Company, Inc., New York, 1942.
- MIRIAM, J. L.: How Well May Pupils Be Prepared for High School Work without Studying Arithmetic, Grammar, etc., in the Grades? *Journal of Educational Psychology*, 6: 361-364, 1915.
- REID, FLORENCE E.: Incidental Number Situations in the First Grade, *Journal of Educational Research*, 30: 36-43, 1936.
- SMITH, L. W.: A Quantitative Study of the Activity Program, *Elementary School Journal*, 33: 669-679, 1933.
- TATE, HARRY L.: An Evaluation of the Project Method, *Elementary School Journal*, 37: 122-132, 1936.
- THORNDIKE, R. L., J. J. LOFTUS, and B. GOLDMAN: Observations of Excursions in Activity and Control Schools, *Journal of Experimental Education*, 10: 146-149, 1941.
- WARD, W. E.: An Experimental Study of Two Methods of Teaching Chemistry in Senior High School, *Journal of Experimental Education*, 11: 69-80, 1942.
- WESLEY, EDGAR B.: *American History in Schools and Colleges*, The Macmillan Company, New York, 1944.
- WRIGHTSTONE, J. W.: Evaluation of the Experiment with the Activity Program in New York City Elementary Schools, *Journal of Educational Research*, 38: 252-257, 1944.

CHAPTER XX

BEING AN EFFECTIVE STUDENT

What to Look For. Note that teaching methods may control the way in which pupils study. Be able to explain the importance of a definite program of study that involves time and place. Why do we have to learn to study in situations that are far from ideal?

What are the best ways to prepare for examinations, and why is cramming ineffective?

In preparing the individual lesson, learn the advantages of preliminary scanning; thorough, intensive reading; acquiring the main thought of the paragraph; special study of difficult parts; note taking and outlining; reviewing the lessons and relating the old with the new; studying several sources; and a thorough understanding of words, charts, tables, formulas, and questions. Be able to explain how these methods improve learning.

How can a good assignment help the student, and what is the purpose of pretesting?

The whole and part methods are described in considerable detail. Their various aspects should be understood and also how these methods can best be utilized.

Learn what are good and poor study habits and their relation to scholarship.

Note that those who study less tend to get slightly better marks but also that those who study less tend to be brighter.

Be able to classify and analyze the most important rules of study.

To what extent can the achievement of pupils be improved by teaching them how to study? What can be done to help them improve their reading?

Examinations vary according to the nature of the questions; some result in better achievement than others. Observe the difference.

How should study time be divided as to length of periods in order that studying be most effective?

Should bright, able students be permitted to take a heavier than average load? Should students have jobs while they attend school?

Introduction. "It's killing time that is the worst enemy of good scholarship," said Ben when the senior boys were discussing how to be a successful student.

"Or procrastination, not getting down to work, which is about the same as killing time," added Ralph.

"A person has to put in a certain minimum amount of time in which he actually concentrates on his lessons or he won't be one of the better students," was Wendell's contribution.

"Who wants to be a bookworm?" asked George, who was barely passing in his work.

To this Carl replied, "A student can put in 20 to 30 hours a week if he has a definite plan and still have time for fun."

"A good school record is the best guarantee of future success," added Ben. "I wish that I had a better system of studying."

As the discussion continued, various ideas about studying effectively were brought up and discussed.

How Methods of Teaching Affect Methods of Study. Methods of study vary with the purposes of the learner, which, in turn, reflect the methods of the teacher. If the teacher is a textbook teacher who "calls for" the facts of the book, the students will uncritically try to memorize the facts in order to repeat them to her. Then the method of study resolves itself largely into one of rote memorizing.

If the teacher's method is a broader one and tends to stimulate problem solving, critical evaluation, and the relating of knowledge, the student will prepare his lessons accordingly. Especially if the student, rather than taking the "next 10 pages," is working on a problem or engaged in a project, he will search for information and relate and fit it into the problem that he is working to solve. A student should study with a clear purpose in mind so that he will be motivated.

Need for a Good System. The first, and probably most important, thing is to acquire the habit of studying systematically. Effective methods of study consist basically in those fundamental principles which underlie efficiency. Doing one's work regularly, persisting until it is done, and not falling behind in it are the general guides for successful study as well as for effectiveness in any field of endeavor. It is assumed that the student has ability enough to cope successfully with his academic tasks. Then the success with which he masters the tasks before him depends in a great measure on his efforts.

Certain general regulations should be followed to achieve efficient study habits. These apply to all but geniuses and very brilliant students, who have their own methods. It might be added that some students with very superior minds fail because they do not observe the best methods. Genius, however, should be exempted from the general advice that will be helpful to the overwhelming majority of students.

The genius, whatever his field, works in his own way, propelled by his great power and the stimulation from his environment to which most persons fail to respond. He should not be interfered with—techniques of study are not meant for him and would only be an interference. But the following methods and techniques, if practiced, will improve the efficiency of most students.

First, have a definite place and time for study. For the child in the elementary school, this is provided by the school program. Because homework is being minimized for the elementary-school pupil, he does not have to organize his home environment for the purpose of devoting much of his out-of-school time to study.

It is more important for high-school students to organize their program so that they have a definite time and place for their work. High-school students have nonrecitation or study time during school hours, which they can either waste or utilize. Consequently, the budgeting of time must be stressed in high school.

As the college student is almost entirely "on his own," if he does not organize his program of work so that his time for study is utilized, he is almost sure to fail. When he is not in class or in laboratory, his time is his own to use as he pleases. If he goes to definite places to study with regularity, he observes the basic principle for becoming a successful student. The best places are the study hall, the library, or his own room.

On the negative side, the student is advised to avoid loitering and loafing. It is all too easy to spend an hour or two with other students between classes, sitting in a room merely talking or playing cards and other games. To move with dispatch to the place where one can get right down to work requires self-discipline, which is difficult in the beginning but, when once begun, is not so hard to maintain.

Definite periods and places for work are conducive to beginning a task. Half of achievement is accomplished if one gets down to work. If a start is made, the likelihood is great that the work at hand will be accomplished. Dilatoriness and procrastination are the most efficient enemies of achievement. The businessman, housewife, farmer, or student who never gets around to answering the letters, preparing the meals, beginning the plowing, or attacking the lesson finds that his work piles up on him and that his accomplishments in the end are small.

In a student's home it is often difficult for him to have a place of his own that is suitable for study. Altogether too frequently he must study in the kitchen, dining room, or living room, where the presence

and activities of the family distract him from effective study. The most isolated room in the house should be reserved for study when students are home. The difficulty of studying at home, because it is a place associated not so much with work as with eating, sleeping, playing, or using one's spare time, can be overcome if the place, table, and other equipment set aside for study are used exclusively for that purpose and not for chatting or playing games. For example, if students have a little library or place for studying, they might avoid using it for anything else by talking or playing in another part of the house. In short, a definite place should be dedicated to work.

In a certain home the piano was in a room known as the music room. The children practiced here but were discouraged from using it for other purposes. Whenever they were found playing dolls, cards, and other games in this room, they were tactfully directed to their own rooms. Consequently, they thought of the room as a place for practicing the piano; thus, when they went into it for that purpose, they were influenced to practice by the associations that they had with it.

A good student devotes considerable time to his lessons. Time in itself is not a great virtue. The time must be used in active and concentrated effort if it is to be effective, and all good students and all people with records of achievement put in many hours of hard work. There is no substitute for time if a person wishes to reach a high level of achievement.

Even though it is of basic importance that the student observe the general principles of beginning work without loss of time in places conducive to study, or, in short, have a definite schedule of study, certain techniques will prove helpful in the actual process of study.

Studying under All Conditions. A student and learner should organize his living so that he can study systematically in as ideal situations as possible, but he should also learn to study when conditions are not ideal. A student must learn to work and study in the midst of noise and distraction. He must also learn to snatch a few minutes here and a few minutes there and thus utilize a large amount of time that otherwise would be wasted. A student cannot depend on ideal conditions for study, although he should organize his program of study so that it will be as ideal as possible. But there are many opportunities for study under conditions that are not ideal but that can be utilized effectively if a person will only train himself to do so.

For example, a good student will study on a bus or read while waiting on a corner. At home, while waiting for dinner, he can snatch a few minutes for his lessons or for general reading. There are many odds

and ends of time, a few minutes now and then, that can be used by a person who has trained himself in this regard.

A student should not, of course, do all his studying during odd times but should use such times when he can and not depend on always having a definite time and place for study. If a person always depends on the ideal, he will miss many opportunities for working effectively.

Furthermore, a student should learn to study in a situation in which there are disturbance and distraction. A student should avoid such conditions as far as possible, but he cannot always do so. He must harden himself to withstand distraction and learn to work in the midst of noise and activity.

Very few people work under conditions that are considered ideal. The stenographer, for example, usually works in an office where there are others at work, and she is subject to interruptions. In the newspaper office the reporters must think and write in noisy and busy surroundings. The man in the office is interrupted by telephone calls and intrusions and must turn his concentration off and on. In countless situations it is necessary to read, write, and think in the midst of noise, distractions, and interruptions.

The student should therefore learn to fight off distractions and concentrate in situations that might ordinarily be disconcerting. This is not easy to do; under such circumstances, it may help to select for reading or study the more interesting material. By practice and repeated attempts, the student will be surprised at how successful he can be in studying effectively in situations in which he may have thought it was impossible to study.

Preparing for the Examination. Many students prepare for examinations by studying intensively just before taking them. They study only indifferently except when they *cram*—that is, try to acquire in a few hours or days of frantic effort what should have been learned by systematic effort over a long period of time and attempt to stuff themselves with enough facts and terms so that they can pass the course. The crammer is hardly ever the student who tries to do exceptionally well in the courses themselves.

Cramming cannot be a sound method of studying, for it violates many sound processes, such as thinking reflectively, maintaining a critical attitude toward references, relating new material to old, and working in a thorough and painstaking manner. It substitutes haste for care, superficiality for thoroughness, and rote memory for reasoning and problem solving.

Furthermore, the student who crams has the attitude that the

material is acquired only temporarily and only for the purposes of the examination. He is not learning it with permanent acquisition in mind. Once the examination paper is handed in, forgetting takes place rapidly. In the first place, there was no attempt at retention; and in the second place the material was only superficially learned.

Occasions may arise when it is necessary to cram. If a person is in a situation where he must marshal many facts for a single occasion, he must cram them. The speaker preparing to discuss a certain topic or the lawyer collecting evidence on a case must cram considerable knowledge, transitory in nature, for the single occasion. However, the cramming is not effective unless the material learned for the moment is associated with a solid background of general principles and definite knowledge. The lawyer, for example, will learn temporarily many details about a specific case, such as persons, places, dates, and amounts of money involved; but in connection with them he will make use of legal principles, which he understands or tries to understand thoroughly. If he had to cram all the details and also the law involved, the likelihood is that he would not be a very effective lawyer.

The best preparation for examinations consists of thorough day-by-day preparation. The student who does not fall behind in his work, always knows the assignment, and has the necessary books, papers, and other equipment will be the best prepared. Such a student can profit by systematic reviews and by more intensive study near the time of the examination, but he avoids the attempt to gorge himself with the whole course in a few hours, as the crammer does, just before the examination. In fact, the best preparation for one who has worked systematically throughout the course and made thorough reviews is to enjoy some recreation and go to bed early the evening before the examination, rather than studying late into the night. This method has not been proved experimentally, but some students have discovered that it results in satisfactory achievement. Even though analogies are not always sound, it may be pointed out that athletes before a contest do not train rigorously up to the minute of the bell or whistle but do their intensive training well before the contest and then taper it off and engage in only light exercises. Light study and a short rest before the examination will probably enable the student to attack the questions with least confusion and greatest clarity of mind.

PREPARING THE INDIVIDUAL LESSON

A major part of most lessons consists in mastering a number of printed pages. On the other hand, in a subject such as arithmetic or

algebra the lesson consists largely in working a number of problems. Even though a few of the following suggestions for effective study apply more to such subjects as reading, geography, history, and literature, they apply in some degree to material like problems in arithmetic, algebra, and geometry.

General Examination of the Content. If the lesson consists of a chapter, the student should first examine it to acquaint himself, in a general way, with the content. He should observe the headings and orientate himself to the content. This general orientation constitutes an intelligent preface to the intensive reading that follows.

In this connection it should be emphasized again that the lesson should consist, not of the "next chapter" or the "next 10 pages," but of certain topics and materials to be found in several references. The mere textbook method of teaching is very limited, and enrichment as obtained by means of extensive reference material is desirable. Even if there is a richness of materials, the problem of studying effectively is not solved and it is still desirable to practice the best methods of preparing the individual lesson.

Intensive Reading. After a general survey of the material it should be studied intensively. Some suggestions for effective intensive study follow.

First, do not hurry. Nobody can study in haste. Cultivate the attitude of digging deep into the lesson. If the student's one desire is to get through his lessons quickly, this is bound to render him an ineffective worker. There is complete incompatibility between hurried studying and mastering the thought of the printed page. The student hurries because he has other purposes more strongly in mind than that of studying and the lessons are merely hurdles to overcome. If the teaching develops interests and an attitude favorable for learning, such obstacles may be overcome. In fact, in every school there is a race and struggle between study activities and distracting tendencies to loaf, "visit," and play. But if the instructional forces are strong enough, the discipline of thorough study will be established.

Master the Main Thought of the Paragraph. Every well-written paragraph should contain a main thought, which is then developed. Not all paragraphs are well written; nevertheless, the student must master the paragraph, and he should pick out its main topic. If he misses the main point, he should reread the paragraph.

Study the Difficult Parts. One bad habit often acquired is that of "sliding over" difficult parts of an assignment. Portions of some lessons are bound to be difficult, but instead of being read perfunctorily they

should be read and reread until mastered. If the difficulties are overcome, later material will not be burdensome; but when a student slides over difficulties rather than working through them, he piles them up against himself. In short, he falls increasingly behind in his work because the failure to master the first difficulty makes harder the mastery of subsequent ones; worst of all, the habit of avoiding hard problems is developed.

Underline, Take Notes, and Outline. As the student reads, he may find it helpful to underline the important terms, statement of principles, and topical sentences. Underlining gives the student practice in picking out what he thinks is important.

He should, of course, underline only in his own book, not in books belonging to anyone else or to the library. It is very distracting to other students to have to read a book in which there is much underlining. An additional reason for a student's having his own books lies in the values that accrue from a fuller use, which includes underlining, making notes in the margin, and even cutting out parts of the text material.

It is profitable to take notes on material as it is studied. Such notes should represent the important ideas. To a large extent, notes are clews to the content of the material that has been studied. They may also serve as a brief record of the difficult portions of a lesson, and they are especially helpful when the student wishes to refer to previous lessons.

Questions may be raised about the value of sustained note taking while the teacher lectures continuously during the class period. In many classes, university and college classes in particular, the teacher lectures, and the students try to take down what he says. This method has been described as the passing of the words from the mouth of the instructor to the notebook of the student without passing through the mind of either. It might constitute better teaching if the students were given an opportunity to react to what the instructor says by means of questions and discussion. Mimeographed outlines of the instructor's lectures could be given the students so that they would not have to be engaged in the process of trying to take down what the teacher says. Little virile interaction of minds occurs during the usual classroom lecture. Probably less note taking in the classroom and more in the library would represent a desirable trend in scholarship.

When material has been underlined and notes have been taken, a profitable next step is to outline these materials. A logical arrangement makes order out of unorganized material, and thus it can be learned

more readily. The important should be distinguished from the unimportant and the main points from the subpoints subsumed under them. Through the process of outlining, this may be done. Not only is outlining an effective method for the first learning of material, but it gives a basis for its review and recall.

Recall, Summarizing, and Review. After the lesson has been studied, the student should reflect on what the author has said. By reflecting, he can attempt to recall the points in the lesson and evaluate them in the order of their importance. In recalling, he summarizes silently; he may find it profitable also to write a summary. Recalling the material and summarizing it not only tend to fix it in mind but also furnish a basis for review.

Both the outline and the summary facilitate review. They should represent the basic framework of the lesson content. When a student reviews his outlines and summaries, he has the clews to the general content. It has been said that a review should be a new view. In reviewing, it is hardly adequate merely to reread the summaries and go over the outlines. Careful and studious attempts to recall related material will enrich the outline; correlated material may be recalled, also. The purpose of reviews is defeated if the student hurries over the outline. Instead, a new view is obtained if he reflects and recalls as many pertinent facts as he can and focuses them on the points of his outline. Summaries and outlines serve as clews to extensive materials that can be brought to mind.

The effectiveness of review has been measured by testing the amount that could be recalled when reviews followed learning by periods of varying lengths of time. Several groups were used so that the test for retention would not be repeated in examining the amount of retention after various weeks. The groups studied a historical passage of 25 lines on the origin of monasticism in western Europe. It was scored as containing 43 separate ideas, or facts; the students were given 2.5 minutes to read it once and then, if time remained, to study it as they wished. They were tested on the passage by writing in essay form for 12 minutes; the results of this test provided the score for immediate recall and learning. The reviews were like the original study and were also followed by a test, which, however, was not scored. After intervals of 2, 3, 6, and 18 weeks, groups of students were tested to note how much each group had retained. Some had had one review; others, two. There was also a group that had had no review. The advantage of one review over no review may be summarized as being about 20 to 50 per cent, with the superiority less in the case of the longer intervals. The superiority of

the two reviews over one review was greater, being about 75 per cent for the 6-week period and 57 per cent for the 18-week period.

Also studied was the effect of spacing the reviews 1, 2, 3, 7, and 9 days after original study as a preparation for a test given 21 days after original study. The results indicate that there is a definite advantage in a review but that it does not matter very much how the review is spaced. The amount recalled after 21 days from the time of original study varied little in terms of spacing of reviews within the 9-day period given, but review itself helped considerably in some instances and always helped somewhat.

Relate New Material to the Old. An effective way of reviewing material is to relate or correlate the new with the old. Usually within the same subjects and among related subjects there is close connection of the content, and when associations of this kind are made the content is easier to recall. Whenever meaning is enriched by additional knowledge, memorizing is facilitated.

For example, in studying in psychology the topics of heredity and environment and the nervous system the student should review his work in the biological sciences. Similarly, if a grade-school student is studying the American Revolution, he will find his field of study enriched by reviewing the geography pertaining to the climate and topography of the sections of the country involved in that war.

The teacher, too, should relate the old to the new. One of the reasons why teachers need a thorough background of knowledge lies in the enrichment that can be achieved through associating old material with the new.

Study in Several Sources. Though it is true that a given reference should be reread until the material is mastered, the pupil and teacher should not overlook the advantage of reading about the same topics in a number of sources. Authors treat the same subjects or topics in a different manner and provide different illustrations, facts, and interpretations. The freshness of different points of view adds a vividness and vitality to lessons that are lost by confining oneself to several rereadings of the same sources.

The problem of note taking may be complicated by the study of several sources rather than one. Notes taken may be recorded selectively, however, and duplication can be avoided. By careful outlining, the main topics of the several references may be included.

Words, Charts, Tables, Formulas, and Questions. Every student encounters the problem of mastering unfamiliar words; of interpreting charts, tables, and formulas; and of answering the questions usually

found at the end of the chapter and occasionally at its beginning. Unfamiliar words should be looked up in the dictionary, and the meaning fitted into the sentence. A good plan is to keep a list of new words and review them occasionally. Better yet, of course, is to read so widely that the words are learned by being frequently encountered.

A common practice of students is to pass over tables, charts, and formulas. These are included in order to summarize in effective form the data at hand and to provide data pertinent to the discussion. Often they require careful study and consequently are skipped. A good plan is to study tables, charts, and formulas until every detail is clearly comprehended and a conclusion drawn. In the case of the formulas particularly, it may be necessary to memorize them, but the meaning of the symbols should be understood before they are memorized, for memorizing meaningful material is more effective than memorizing material the meaning of which is not comprehended.

Questions at the beginning of the chapters enable the student to prepare himself for the lesson before he begins reading and to test his knowledge after he has studied. Whether the questions are at the beginning or at the end, a good habit for a student to develop is to study them before beginning the chapter; to examine some of them again during the reading; and then, after the first reading is completed, to see whether or not he can answer them all. Reading the questions before studying and occasionally while studying causes the student to search for the answers. Thus, purpose and direction are given to reading.

In general, the principle of studying thoroughly and painstakingly applies to the meaning of words, to the interpretation of charts and tables, to the learning of formulas, and to the answering of questions. Careful work is of first importance. Beyond this, there may be incidental techniques of importance, also.

A Good Assignment. In a sense, the questions that the author provides are his assignment, but the teacher also can give purpose and direction to the lessons by specifically directing the student to answer definite questions and to find information about specified topics. Some teachers discuss the new material to be studied with a view to interesting the pupils in it. Students must know definitely what they should do, or else they will work ineffectively. Whether assignments should be made frequently and thus cover comparatively little material at a time or should be made less frequently and thus cover a considerable amount of material, such as several important topics, is a question that is often raised. It is sometimes contended that, if assignments are made every day, students will not learn to work independently but will acquire

the habit of being spoon-fed. There is considerable validity to this point of view. One of the major objectives of teaching methods and how-to-study techniques is to train students to work independently through a large amount of reference material. But whether assignments are large or small, the teacher should develop a vividness about the work so that the students will have a motive and consequently will be interested.

Pretesting. Students vary widely in the amount of information that they possess pertaining to the course before it is taken. In courses that are not highly specialized or technical, some students have sufficient knowledge at the beginning to pass with a fair mark. In fact, in some instances, the best 15 per cent of students at the beginning of the course obtain higher scores than the poorest 15 per cent at the end. A surprising amount of overlapping of scores is obtained on an examination given at the beginning and end of a course. Furthermore, even though considerable gain is made on the average, some answers that were given correctly at the beginning of a course are given incorrectly at the end. Probably some of these answers were not known in the beginning or at the end and were given differently by chance.

The problem educationally is to discover what the pupil knows and does not know before he takes a course and to direct his studying and learning accordingly. Going over material that is known is a waste of time. Emphasis should be directed toward those phases of a subject about which the pupil knows least. Pretesting and diagnostic work give a basis for more individual teaching and more fruitful study.

WHOLE AND PART METHODS

Meaning of the Whole and Part Methods. Much of the discussion concerning the superiority of the whole method versus the part method centers in the memorizing of poetry. Shall the learner study and read the poem from beginning to end until the whole of it is memorized, or shall he memorize it line by line or verse by verse? The learning of poetry lends itself well to the discussion of the whole and part methods, but the fact is that memorizing poetry in the average present-day school is a relatively unimportant matter. One might argue that it should have greater importance, but at present most lessons do not include learning poetry by heart.

But the problem of learning by wholes or by part is applicable also to lessons in vocal and instrumental music, arithmetic, history, geography, reading, and other subjects. Natural, or normal, divisions exist in these areas, such as a song, an instrumental selection, a process in

arithmetic, a chapter in history, a topic in geography, and a step in reading. One can practice the whole selection in music or parts of it at a time; in history and geography, part of a topic or the whole. In reading, a letter-and-word method, as when phonics is used, or larger units such as phrase and sentence, with little attention paid to the parts of the word, may be employed. In these examples we have the principle of the whole-and-part method illustrated as smaller units against larger ones. The parts-and-wholes concept is really a relative one and should be considered as such.

A combination part-and-whole method should also be considered, for the method of learning need not be either part or whole but a combination of these two. There are many possibilities of combining the two. In practicing a piano selection, one may first play parts of it and then play the whole; or play over the whole a number of times, practice the difficult parts, and then play the piece as a whole. Thus there are many possible combinations of the part-and-whole method.

There is considerable virtue in this method. It enables more time to be devoted to specific weaknesses. Thus, if a health diagnosis shows that a person's specific weakness lies in excessive weight, attention will be devoted to exercises and modes to correct that deficiency. In fact, the entire diagnostic movement in education is based on the part-whole method, with special emphasis on correcting weaknesses and then achieving competence in the entire process or problem.

Comparative Effectiveness of the Part and Whole Methods. Many experiments have been conducted to test the effectiveness of these methods, singly and in combination. Some experiments favor one method, some another. Probably more evidence exists in favor of the whole than of the part method. Nevertheless, little is to be gained by concluding that the whole method is superior and then proceeding to incorporate it into our educational procedures to the exclusion of others. Considerable discrimination is necessary. Instead of generalizing too broadly, we shall seek to identify the virtues of each and examine the factors to take into account in evaluating the whole, part, or combination method.

The whole method has the advantage of causing the learner to work in larger units, comprehending the interrelationship of parts and their logical sequence. In learning a poem of several stanzas, for example, if the stanzas are learned individually the general theme of the poem tends to escape the reader, and the relationship and sequence of the stanzas are lost. After mastering one stanza the learner goes back to the beginning instead of starting the next one. This tends to establish

the wrong order of connections—a fact that is apparent when children reciting their “pieces” have difficulty in beginning the next stanza and tend to go back to the beginning of one that they have recited. In general, logical and sequential order is best established by studying wholes or longer units.

The method of learning, whether by whole, part, or combination, depends on the difficulty of the material and the learner's intelligence. These two factors go hand in hand. The difficulty of material should be interpreted in terms of the ability of the learner. Material that is difficult for a third-grade child is likely to be easy for a college student. Difficulty, in other words, is a relative matter; and ability, too, is relative.

If the material is difficult or the ability low, the value of the whole method is decreased and that of the part method increased. Then the material should be assimilated piece by piece. When it is easy or when the ability of the learner is high, the whole method is more effective. The student can master larger units effectively, for he can comprehend them.

Furthermore, if the selection, chapter, or unit is difficult, the student of less ability will become discouraged if he must attack it as a whole. For a long time, no visible progress will be made, and discouragement may result. But if in such a situation the problem is solved part by part, the learner will be encouraged by the feeling that he is making progress. In working arithmetic problems, for example, the solving of an individual problem is what stimulates the student to work the next. If he had to do a single problem that took as much time as 10 problems, he probably would drop the work before it was completed and accomplish less than when he worked individual problems and was spurred on by success in solving them.

Much stress has been placed on the value of the whole method, in that it enables the learner to apprehend the continuity of the thought and to see the problem as a whole. It follows, therefore, that the value of the whole method is in proportion to the meaningfulness of the material learned. The more meaningful the material, the greater the advantage of the whole method; the less meaningful, the less the advantage.

One of the great values of the whole method lies in making a task a *meaningful* whole. Comprehending the main principles of a lesson, becoming acquainted with the characteristics of the entire violin concerto, knowing what a course or subject is going to cover, in general, being orientated to the problem in its entirety—this meaningfulness to the learner enables him to learn material better than if he studied it in

parts. Learning by parts may cause the learner to learn more by rote, not seeing the interrelationship of individual ideas and losing the general theme or concept of what is learned. Thus, if the whole method is to be of maximum effectiveness for both student and teacher, it must be used to develop a thorough meaning of the whole and the interrelation of the parts.

The instructor—and the student, too—should apply these facts and principles with discrimination, so that a maximum of learning is achieved. In general, a student should conceive of his problem as broadly as possible and see its connotations and implications. In working on an individual lesson he can enrich it by associating it with related ones. In trying to master material it is effective to comprehend the whole in a general way, work on the difficult parts, and complete the lesson by studying it as a whole. No indisputable facts exist to prove one method better than another, but the principles that have been set forth will be useful as a general guide.

STUDY HABITS AND SCHOLARSHIP

If there is a causal relationship between study habits and scholarship, students with better habits should obtain better marks than those who have not such good study practices. Surely this would be true if other factors, such as intelligence or capacity, were equal. In an investigation made of the study practices of high-school pupils, those of grades 9, 10, 11, and 12, to determine the relationship of study practices and scholarship the students were given a list of study methods and procedures by which to check their practices as *never*, *occasionally*, *usually*, or *always*. They were divided into groups according to I.Q., and scholarship was determined for various practices of study, whether *never*, *occasionally*, *usually*, or *always*. In general, it was found that good marks accompanied desirable practices. For example, the practices of looking up new words, skimming over material before careful study, reading silently without moving lips, getting lessons day by day to avoid cramming, and reviewing notes before examination were reflected in the students' marks. Those whose practice was *never* or *occasional* almost consistently obtained lower marks than those whose practices were *usually* or *always*. The differences were not large, but apparently those who received better marks had better study habits; and probably we may conclude that better study habits result in better marks.

Scholarship and Amount of Study. A number of studies have been made, especially at the college level, to discover the relationships among

scholarship, mental ability, and number of hours per week devoted to study. The number of hours is usually determined by having students keep careful record of their study time. In Table 17 the relationships are given among these various factors. In these data the student who implies that he is bright because he does not study very much will find some support because of the fairly small but consistently negative correlation between mental-test rating and number of hours devoted to study each week. The correlations range from - .15 to - .41. There is a moderate tendency for the brighter students to study less and for the duller to study more.

TABLE 17. THE RELATIONSHIP AMONG COLLEGE SCHOLARSHIP, MENTAL TESTS, AND HOURS OF STUDY AS DETERMINED BY INVESTIGATION IN DIFFERENT UNIVERSITIES*

	450 Syracuse University freshmen, fall, 1923	221 Yale University freshmen, spring, 1926	105 University of Minnesota freshmen, fall, 1929	130 University of Iowa freshmen, fall, 1928
r 12†	.60	.28	.65	.69
r 13	.32	.00	— .06	— .28
r 23	— .35	— .15	— .20	— .41
r 12.3	.80	.28	.65	.66
r 13.2	.70	.04	.11	.00
r 23.1	— .72	— .15	— .22	— .32
R1 (23)	.82	.28	.66	.69

* After Williamson, 1935.

† (1) Quarter or semester scholarship, (2) mental-test rating, (3) total number of hours of study for one week.

The results from the various universities on the relationship of scholarship and hours of study are represented by coefficients of correlation, which range from a small positive correlation of .32 to about the same-sized negative correlation of — .28 and which show that no relationship exists in a group of college freshmen between scholarship and the number of study hours. This fact should not be interpreted as indicating that it does not pay to study a greater number of hours, for it should be remembered that abler students tend to study less than do duller ones.

In general, the best practice is for most students to study between 20 and 30 hours per week. Less than 20 is not enough to obtain optimum results. More than 30 or possibly 35 hours brings diminishing returns. Long hours of study do not make up to any great extent for low mental ability. On the other hand, if a bright pupil spends too little time on

his work, he will not become sufficiently acquainted with it and possibly will fail to do it satisfactorily. The failure of many to obtain satisfactory marks lies in their habit of not studying an average amount. In the case of all students who study average to maximum amounts and still fail, investigation should be made to determine whether their difficulties are special disabilities in reading, low mental capacity, health and emotional problems, or a wrong course of study. Experimental attempts may be made to improve the learning of the failing pupil on the basis of such analysis. In some cases, improvement will follow. In many others, failure will continue. Control of study habits and the number of study hours may help, but no investigation has revealed any phenomenal improvements.

The Most Important Rules of Study. Among the factors affecting efficiency in learning are the study habits of the learner. Evidence showing improvement from attempts to control and modify such habits is rather discouraging. Nevertheless, a teacher should try to train her pupils to adopt good study habits. A consideration of rules of study or advocated practices may make us conscious of habits that, if established early in life, can make a significant difference in the ultimate scholarship of a student.

An analysis of over 500 contributions on this subject resulted in the selection of the 10 rules most frequently mentioned. These are listed in Table 18 as given in an article by Cuff. As he suggests, they are probably the result of research at the college level and are more applicable to college than to elementary- and high-school students. However, many are applicable to students of nearly all ages.

These rules can be classified in a general way into two types: (1) regularity and attention to study; (2) the method. In the first category fall the rules about having a definite time for study, being alone, ignoring distractions, and studying in a favorable environment. Those pertaining to method of study are note taking, preliminary skimming of material, preparing illustrative examples, clearly defining the task, reviewing previous lessons, and silently reciting or reviewing lessons after having studied them.

Because many schools have supervised study periods, it is especially necessary that the teacher be conscious of the best methods of study. It is then that the teacher has her opportunities to direct the learning of her pupils by applying the rules of study. There is always the danger of narrow and indiscriminate application of rules, but a good teacher will try to generalize their application and develop good study habits in her pupils.

TABLE 18. THE TEN RULES FOR STUDY MOST FREQUENTLY LISTED IN 500 CONTRIBUTIONS*

Rank	Rule	Percentage of studies emphasizing rule
1	Have a definite time for study of specific lessons	94
2	Get lessons alone	83
3	Take notes on lectures	72
4	Ignore distractions	66
5	Skim over material before reading in detail	55
6	Work out individual examples to illustrate general rules and principles	52
7	Seek a favorable environment for study	50
8	Have a clear notion of the task before beginning	48
9	Review previous work before beginning an advanced assignment	47
10	Recite silently immediately after reading a lesson	42

* After Cuff, 1937.

Besides listing the rules that have appeared most often, Cuff analyzed the study habits of elementary- and secondary-school pupils by asking them to check from a list of the 75 most frequently listed rules those which they practiced or observed. Responses were classified according to the quality of students as indicated by their achievement, test intelligence, and C.A. It was found, for example, that the duller students more frequently looked up new words in the dictionary and that the superior children did not to a great extent "recite silently immediately after reading a lesson." These are merely illustrative, suggesting that the study habits of the bright students are not always those recognized by authorities as being the best. Bright students are able to learn because they are bright and consequently do not need to observe rules that are more useful and necessary for those who need help and guidance in their learning. It should be remembered in this connection, however, that very little evidence exists to indicate that the bright and able pupils are much helped by special methods and aids of various kinds.

Table 19 lists the rules or methods of study that differentiate most clearly the bright and able from the opposite groups. According to this, bright and able pupils have clearer notions of the work, grasp meanings, conceive of examples better, and use facts more widely. This is not unexpected; such abilities are symptomatic of brightness. Some of the rules, however, reflect good study procedures; and several of

TABLE 19. THE TEN MOST SIGNIFICANT METHODS OF STUDY CHARACTERISTIC OF HIGH-SCHOLARSHIP, MOST INTELLIGENT, AND UNDERAGED GROUPS MORE OFTEN THAN OF OPPOSITE GROUPS IN 1,250 PUPILS OF GRADES FOUR TO TWELVE*

Composite rank	Question	Answer by good more often than by poor students
1	Have you a clear notion of the task before beginning the work of a particular study period?	Yes
2	Do you make complete sentences while writing?	Yes
3	Do you seek to master all the material as progress is made from lesson to lesson?	Yes
4	Do you grasp the meaning of a chart or table without difficulty?	Yes
5	Do you try to interpret work at a natural break in the printed material, such as at the end of a chapter?	Yes
6	Do you take notes while reading or studying?	No
7	Do you work out individual examples to illustrate rules and principles?	Yes
8	Do you provide yourself with materials required?	Yes
9	Do you use facts learned in one class to aid in preparing for another?	Yes
10	Do you read each topic in a lesson separately until it is clearly understood?	Yes

* After Cuff, 1929.

those given are excellent suggestions for the development of good study habits.

Effects of Supervised Study on Less Able Students. Because colleges and universities have been faced, during the past decade especially, with the problem of caring for increasing numbers of weak students, various methods have been tried to save failing freshmen. Several investigators have concluded that attempts made to help students in the lowest intelligence-test quarter pay very small dividends. In spite of such conclusions, efforts continue for helping students of low capacity for college work.

One of the attempts consists in the effort to improve the scholarship of the lowest fifth of the students by supervising their study. An interesting experiment was made to discover the extent to which the scholarship of failing freshmen college students could be improved. Students in the lowest two-tenths on the American council test, except those with high-school records that were fair or better, were included in the experimental group. The control group consisted of those from two pre-

ceding freshman classes who were in the lowest two-tenths also and also of those from the class who could not be scheduled with the experimental group.

The experimental group met three afternoons a week from two to five o'clock for a whole semester. Two hours a week was used to discuss principles of study, and the rest of the time in actual study. Once a week, instructors would come in and help or advise the students on their courses but would not coach or drill them on subject matter.

It was found that 54 per cent of the marks made by the experimental group during the semester of supervised study were C or over, whereas only 23 per cent of the control group did as well. On the basis of 4 years' work, however, little difference could be seen in the achievement of experimental and control groups. Most findings were to the effect that, for the quarter or semester involved, improvement was brought about. But in the successive quarters and in the end, little improvement occurred. Therefore, apparently, supervised study for or control over weak students must be maintained if worth-while results are to be obtained. Some investigators are pessimistic and feel that the first year's work of a weak student is such an obstinate indication of what he will accomplish in subsequent years that little can be done about it. Not very often do failing students low in aptitude rating change their status, even though they may make some favorable response to supervised study or other controls over their method of learning.

Improving Reading Ability. An effective method of improving a pupil's ability to learn is to improve his reading ability. Possibly the most nearly universal key to learning is the power to read. To a considerable extent, our knowledge is obtained by reading the printed page, and a large share of study and learning activity consists in reading text- and reference books on the various school subjects. Even in arithmetic, algebra, and the other mathematical courses, teachers often maintain that the disabilities of many pupils lie in their inability to read effectively. Consequently, special training that improves reading ability increases the power to learn.

A special attempt was made to improve the reading ability of junior and senior high-school pupils who, reading tests showed, were a year or more below their grade level. Those selected for remedial work were organized into small classes, which consisted preferably of five or six pupils. Classes of nine or more proved too large for the individual attention that effective remedial work requires.

Certain weaknesses characterize students who are a year or more below the average for their grade. They are weak in understanding the

meanings of many words, in selecting the central idea of a paragraph, in comprehending the meaning of a sentence, and in their rate of reading. Certain other disabilities or weaknesses of the students became apparent during the remedial work. Their oral reading was jerky; they manifested difficulty in distinguishing meanings of words that differed comparatively little in their spelling; and they possessed meager vocabularies.

Treatment started by explaining to the students the general purpose of the class, so that they would have a cooperative attitude toward the work. The remedial work itself consisted in using lesson material from readers, science texts, and other books classified for grades one or two below theirs. The pupils were asked to answer detailed questions on the paragraphs, to prepare a sideheading for each of them, to match topic headings with paragraphs, to read paragraphs, and to recall the content. Workbooks in reading were used, as well as other means for increasing vocabulary, such as using new words in sentences, finding opposites, drilling on prefixes and suffixes, and working with crossword puzzles. The students were also trained to read more rapidly by increasing the eye span, and scores were kept in order to stimulate speed. Suitable books were recommended; the students were urged to read widely.

This remedial-reading program was carried out over a period of 2 years; then the students were tested to observe its effect on ability to read for details, the gain in vocabulary, the ability to obtain the central idea of the paragraph, the ability to understand sentences, and the gain in rate of reading. Nearly all pupils given remedial work showed improvement, the lowest average percentage being 88 in rate of reading and the highest being 96 per cent in vocabulary.

The average improvement per grade ranged from 1 year 3 months for the twelfth grade in ability to read for details to 5 years 3 months for the ninth grade in rate of reading. The progress made each 12 months by an average grade is 12 months, or 1 year, so that the additional progress because of the special training was equivalent to over 1 and up to over 5 years. Even though some of this gain is only temporary, retesting after a period of several months indicated that far from all the gain is lost. As the time after the period of special practice increases, the amount of the gain conserved decreases; in other words, time tends to wipe out much of the special gains. Consequently, a remedial program in reading, arithmetic, or any other subject should not be limited to a single period of several months but should be continued with reasonable consistency throughout as much of pupils' school

careers as is necessary to maintain a high standard of efficiency in reading and in the other subjects. When the remedial program is over, students fall back rather rapidly in their abilities. Probably these losses can be prevented and the gains conserved by a consistent, even though intermittent, plan of remedial work.

A student reads better if he reads faster and comprehends more of what he reads. Consequently, speed and comprehension should be improved. In doing so, the emphasis should probably be placed on comprehension first and speed second. The first requirement is that the student understand or comprehend what he is reading. He should try to speed up a little now and then, but not at the cost of sacrificing comprehension. If he stops occasionally at the end of the paragraph, tries to recall what he has read, and then checks the paragraph to see whether or not he has got its ideas and thoughts, he will know whether or not he is reading with comprehension.

The students who read for comprehension primarily will improve their speed, too; for when a pupil improves his power to understand what he reads, he also learns to read more rapidly. Basically, speed of reading depends on the power to comprehend.

Study and the Nature of the Examination. In order to investigate methods of study and efficiency of learning, students were examined after they had been told that they were to be tested by an essay, completion, multiple-choice, or true-false examination. The material to be learned consisted of a chapter on memory in a psychology textbook, and the students were helped by lectures, recitations, and supervised study. They were divided into four groups according to which examination they were to prepare for. All students, however, were given the four types of test, two of which, the essay and completion, may be regarded as the recall type, and the other two, the multiple-choice and true-false, as the recognition type. Results of the testing were analyzed to discover for which type they learned most efficiently and also to note the difference in methods of preparation for the various types.

In all tests—essay, completion, multiple choice, and true-false—the students who studied for the essay and completion test, or the recall type, tended to do best. Those who prepared for the true-false and multiple-choice tests did not do so well on their own tests as did the students who had prepared for the essay and completion tests. The differences are not large, but they could not be expected to be so; for the material studied consisted of a single chapter, and the mind-set for specific kinds of test should not be expected to cause a large difference. The consistency of the difference in favor of study for the recall type

of examination is important and indicates how the examination controls methods of study.

Distribution of Study and Practice. In the schoolroom the program of study may be arranged so that study periods are long, average, or short. In preparing lessons the student may work on the same lesson for a whole evening, or he may divide his time of study among several lessons. A question may be raised regarding the length of period that is conducive to most effective learning. If a child, for example, spends 2 hours a week on her piano lessons, should she practice one long 2-hour period, two 1-hour periods, four 30-minute periods, six 20-minute periods, or eight 15-minute periods? Furthermore, it is important to know how much time should elapse between the periods of practice.

The period should not be too long, or, during parts of it, interest will lag and achievement will be reduced. If, on the other hand, the periods are too short, time is usually lost in beginning and stopping. The amount lost in this way may be a large proportion of the total; the learner no more than gets well started, or "warmed up," before the time is up. Thus the pupil is cut off when the period of greatest efficiency is reached. If the period were longer, practice and learning would be continued through the minutes of greatest efficiency.

The length of the period should vary according to the age of the learner. In the matter of piano practice, which was used to illustrate the division of 2 hours into practice periods of different length, it is conceivable that for an adult expert in music who is motivated to achieve a high degree of artistry, long periods could be very profitable. They permit the practice of the material as a whole, whereas short periods restrict practice to bit-by-bit work or to smaller pieces.

In the case of children, whose power to sustain attention is less than that of adults, short practice periods of about 10 or 15 minutes will prove more profitable than long periods. A short period of intensive practice is better than a long one in which the attention begins to lag and a distaste for practice sets in.

The length of the period varies with the nature of the material or subject matter. A drill period in addition combinations or the multiplication tables should be short. It has been discovered that drills of about 10 minutes in length can be just as effective as those two and three times as long. Daily short drills, in which keen interest is maintained, is of maximum effectiveness for teaching the combinations in arithmetic, words in reading, and various facts in other subjects taught by the drill method.

In certain fields that by their nature are best studied through re-

flective thinking, careful analysis, and speculation the periods obviously should be longer. Subjects like geography and history, if studied for their principles and implications, need longer periods for study and for recitation.

When such subjects are taught narrowly and stress is placed on bare data and oversimplified events, the drill periods that may be described as "short and snappy" are probably best. A class period in geography or history devoted to a discussion of the reasons for events and the trend of situations and to making predictions or speculations should be more leisurely and extend over longer periods. One cannot, for instance, discuss the economic implications of the First and Second World Wars by the quick-drill method. The students will need time to set forth the facts and draw conclusions, which in turn should be criticized and evaluated.

If in a geography class the topic consists of whether the Dakotas should have been left as grazing lands instead of being settled by farmers, who plowed up the prairie, the period should be longer than one devoted to drill about the location of cities in those states. Such a problem requires earnest and premeditated consideration compared with that required by the more mechanical phases of work. Critical and analytical work cannot be carried on in short periods.

Good scholarship is not nourished by the hurry and scurry that characterize so much of our schoolwork. Short hurried periods, speed tests, and time-limit drills have their value in acquiring a number of skills; but if carried over to phases of schoolwork that by nature require penetrating analysis and the making of associations, the result will be the acquisition of unrelated factual elements.

The optimum length of period depends to some extent on the age of the learner and the nature of the materials being learned. In general, it is a sound principle to have reasonably short practice, study, and recitation periods rather than long ones. The best length is one throughout the whole of which the learner maintains maximum attention and proficiency. If the period is too long, loss results because of reduced efficiency. Part of such a period could be utilized at a different task where interest could be maintained. If it is too short, the momentum of being under way is lost through stopping work when learning is at a high level.

The data in Table 20 indicate that the learning period should not be too long; nor should it be too short, with a comparatively long interval between periods. The findings indicate most conclusively that long single periods are least effective, probably because of a drop in interest

and, if very long, because of actual fatigue. Periods can also be too short and the intervals between them too long. The intervals should be of such a length that the learner is well rested by them and resumes the task with a maximum of interest and skill. If the intervals are too long, some of the acquired skill will be forgotten and the learner will have to "warm up" to the task again because of a loss.

Thus, the period should be long enough to reach and maintain maximum efficiency; yet it should not be so long that efficiency is lost. The interval between practice should be long enough to provide a complete rest but not so long that some of the previously acquired abilities are lost. If in doubt, tend toward shorter periods of learning, with practice almost every school day. Practice three to five times a week is probably best; once a week is probably not often enough. Many factors, such as the nature of the material learned, the age of the learner, teaching methods, and the motivation, are to be considered in determining the length of practice periods and the interval between them.

Heavy Student Load and Learning. Some students, particularly in junior and senior high school and in college, are permitted to undertake a heavy load by carrying an extra subject. Students given such permission are, with rare exception, of high mental capacity or those who have demonstrated good scholarship by getting high marks. Often the teacher or principal is faced with the question of whether or not a capable and ambitious student should be permitted to take more than an average load. Will increasing the load from, for example, four subjects to five result in a poorer quality of work?

TABLE 20. THE EFFECT OF LENGTH OF PRACTICE PERIODS AND THEIR DISTRIBUTION ON ABILITY TO ADD TWO-PLACE NUMBERS*

Group	Practice period	Frequency	Extent of practice	Gains in numbers attempted†	
				Number	Per cent
I	60	Once	Continuously	4.1	10.9
II	20	Once a day	3 days	14.7	35.9
III	10	Once a day	6 days	15.3	33.1
IV	10	Twice a week	3 weeks	14.6	28.6

* Adapted from H. B. Reed, 1924.

† Gains were found by subtracting the number attempted the first 10 minutes from the number attempted the last 10 minutes.

In general, it is safe to permit selected students to take an extra subject. When the required work does not suffice to challenge their full efforts, they lose interest and neglect their work. On the average,

their scholarship will not be poorer for the heavier instead of the lighter program. In fact, a slight improvement may result. It is a case of a busy person's doing many tasks with zest, whereas if he had few tasks to do, he would not do them so well. The acceptance of more work increases the feeling of responsibility, so that selected students will devote more intensive effort to meet the increased program.

Some pupils, if given more schoolwork, will not achieve so well as they did when their program was lighter. In analyzing such cases, one should recognize that some pupils fluctuate in their scholarship even when their load remains average. Therefore, it is difficult to determine whether a heavier load or other reasons cause poorer work. Some pupils with no change in load show a marked decline, also. On the whole, when selected students can take an extra subject or additional credits, they generally manifest improvement. If certain individuals show a marked decline in scholarship, they should be carefully studied and observed to determine the reason. As a general principle, pupils should be given so much work that they attack it earnestly and with maximum interest.

Student Employment and Achievement. In college particularly and in high school, too, an important number of students are employed part time. Many students work a few hours a day in stores, offices, restaurants, and homes, on the farm, and in other places. Working for wages and for board and room while going to school is a common practice among many high-school and college students. Some teachers believe that students should not be employed while going to school because this interferes with a good program of study and thus prevents them from getting as much out of school as they would otherwise.

A few investigations indicate that employment does not interfere with a student's success in his school subjects. Students whose employment does not exceed 3 hours a day earn the highest average marks, and students who are not employed have the lowest average. Those who are employed 4 or more hours a day do not do quite so well as those who do not work as much. The differences between the groups are not large, but the evidence indicates that students who are employed a moderate amount are not handicapped by such employment.

Even though school marks do not suffer from moderate employment and suffer only a little from what may appear as too many hours of outside work while attending school, still the student may suffer by being kept out of school activities. It is not known whether or not employment has this effect; but if it did, the effect might be a very considerable one, for students should participate in the extracurricular

activities. Employment while in school should not consume so many hours and come at such a time that students are prevented from doing their best work in their subjects and from engaging in the school activities. Part-time employment if wisely controlled will not affect school work and activity adversely but will actually give many students valuable experiences that will contribute to their education and maturity.

SUMMARY AND REVIEW

Narrow teaching confined to the pages of a textbook results in students limiting their work to a few textbooks; but if teaching is based on projects, problems, and activities, students will study many sources.

Students need to establish a system of studying. The main essential is that the student actually settles down to work every day and puts in plenty of time. A schedule that includes a definite time and place will prove very helpful, though a student must learn to snatch time for study when he can and also to study in the midst of distractions.

The best preparation for examinations is by thorough daily preparation and systematic review. Cramming is a superficial preparation that results in fragmentary learning.

In preparing the individual lesson, first scan the contents in order to get a general idea of what it is about. Then read it intensively, get the main thoughts of the paragraph, reread the difficult parts, take notes and outline them, review carefully shortly after studying a lesson, and try to relate old and new material. It is well to study several references. Unknown words should be mastered, as well as tables, charts, and formulas. The teacher can help students by making an insightful assignment and by pretesting the students to see what they actually know before they take up a topic.

The whole-and-part methods consist, respectively, in studying a unit as a whole and studying it part by part. A combination method is usually best. The difficulty of the material and the maturity of the learner are factors to be considered in connection with the whole and part methods.

Good methods of study result in better scholarship. Good students tend to study slightly less than poor students but get better marks because they are usually bright and learn readily.

Good rules of study consist in putting in an adequate amount of time and using the effective methods that have been described.

The work of students can be improved by supervising their study and teaching them to read, but the results do not seem to be permanent. A sustained program is needed. In helping a student improve his read-

ing, consideration must be given first to comprehension and second to speed.

Periods of study should not be so long that time is lost through disinterest and fatigue or so short that proportionately much time is lost in starting and stopping.

Bright, able students tend to do as good or better work if they take more than an average load. Students who are partly employed do better, too, if the employment is not more than about 3 hours per day.

Test Your Thinking

1. What should a student do and what should he avoid if he wants to develop an effective system of studying?
2. What are the advantages of learning to study in situations that are not ideal?
3. What is the best way of preparing effectively for examinations?
4. In preparing the individual lesson, thoroughness and completeness are fundamentals which the student should observe. Comment in detail.
5. What do a good assignment and pretesting have in common?
6. One can glibly say that the whole method is better than the part method. The answer to the question of which method is better is not so simple as this. Explain the various factors that are involved in determining the best use of these methods.
7. The evidence seems to indicate that it does not pay to study many hours each week. Comment.
8. There are various rules of study, and good ones, too; but it seems that the best way to be an effective student is really to work at one's lessons a sufficient amount of time, and then those who have enough intelligence will succeed very well. Comment.
9. The evidence seems to indicate that attempts to teach college students how to study do not bear much fruit. Comment.
10. Do you think that the scholarship of grade-school pupils could be permanently improved by how-to-study courses?
11. Many parents complain because their children do not learn how to study. What is your reaction to these complaints?
12. The nature of the examination controls the way students study. Discuss.
13. Some students should take an extra course. Comment.
14. A little student employment is desirable. Comment.

References

- BERRIEN, F. K., J. L. KENNEDY, and D. L. CARMEL: How Quickly Do Students Start Studying? *School and Society*, 55: 482-483, 1942.
BILLS, ARTHUR G.: *The Psychology of Efficiency*, Harper & Brothers, New York, 1943.

- BIRD, CHARLES, and DOROTHY M. BIRD: *Learning More by Effective Study*, D. Appleton-Century Company, Inc., 1945.
- BLOMMERS, P., and E. F. LINDQUIST: Rate of Comprehension of Reading; Its Measurement and Its Relation to Comprehension, *Journal of Educational Psychology*, 35: 449-473, 1944.
- BRIDGES, L. H.: Speed versus Comprehension in Elementary Reading, *Journal of Educational Psychology*, 32: 315-320, 1941.
- BROTHER, RICHARD: The Relationship between Freshman Marks and Study Environment, *Journal of Educational Research*, 29 (No. 8): 589-592, 1936.
- BROWN, C. W.: The Study Habits of Failing and Successful Students in the First Two Years of College, *Journal of Experimental Education*, 9: 205-208, 1941.
- BROWN, ROBERTS W.: A Comparison of the Whole, Part, and Combination Methods of Learning Piano Music, *Journal of Experimental Psychology*, 11: 235-247, 1928.
- CUFF, NOEL B.: Study Habits in Grades Four to Twelve, *Journal of Educational Psychology*, 28: 295-301, 1937.
- DIGNA, SISTER M.: An Integrated Program of Remedial Reading, *Journal of Higher Education*, 13: 209-211, 1942.
- DiMICHAEL, SALVATORE G.: Increase in Knowledge of How to Study Resulting from a How-to-Study Course, *School Review*, 51: 353-359, 1943.
- DiMICHAEL, SALVATORE G.: The Transfer Effects of a How-to-study Course upon Different I.Q. Levels and Various Academic Subjects, *Journal of Educational Psychology*, 34: 166-175, 1943.
- DOUGLASS, HARL R., and HAROLD C. BAUER: The Study Practices of Three Hundred Ninety-five High School Pupils, *Journal of Educational Psychology*, 29: 36-43, 1938.
- HEILMAN, J. D.: Student Employment and Student Class Load, *Journal of Educational Psychology*, 30: 527-532, 1939.
- JENSEN, MILTON B., and LEMAIRE A. JENSEN: Ten Experiments on Whole and Part Learning, *Journal of Educational Psychology*, 28: 37-54, 1937.
- JONES, EDWARD S.: *Improvement of Study Habits*, Foster and Stewart, Buffalo, 1945.
- LAYCOCK, S. R., and D. H. RUSSELL: An Analysis of Thirty-eight How-to-study Manuals, *School Review*, 49: 370-379, 1941.
- MCGEOCH, GRACE O.: Whole-part Problem, *Psychological Bulletin*, 28: 713-739, 1931.
- MCKOWN, H. C.: *How to Pass a Written Examination*, McGraw-Hill Book Company, Inc., New York, 1943.
- MEYER, GEORGE: The Effect on Recall and Recognition of the Examination Set in Classroom Situations, *Journal of Educational Psychology*, 27: 81-99, 1936.
- MILLS, HENRY C., RUTH E. ECKERT, and MURIEL W. WILLIAMS: Study Habits of High-school Pupils, *School Review*, 42: 755-761, 1934.
- PARR, R. W.: *How to Study Effectively*, Prentice-Hall, Inc., New York, 1938.

- PETERSON, H. A., and others: Some Measurements of the Effects of Reviews, *Journal of Educational Psychology*, 26: 65-72, 1935.
- PIERSON, C. D., and C. NETTELS: The Scholarship of High-school Pupils Taking Five Solids versus Those Taking Four Solids, *Educational Research Bulletin* (Los Angeles City Schools), 7: 2-3, 1927.
- PRATT, MARJORIE, and LINDA BARRY: A Remedial Reading Program in a Public High School, *School Review*, 45: 17-27, 1937.
- REED, H. B.: Distributed Practice in Addition, *Journal of Educational Psychology*, 15: 248-249, 1924.
- ROBINSON, FRANCIS P.: Speed versus Comprehension in Reading, *Journal of Educational Psychology*, 31: 554-558, 1940.
- RYANS, D. G.: Some Observations Concerning the Relationship of Time Spent at Study to Scholarship and Other Factors, *Journal of Educational Psychology*, 30: 372-377, 1939.
- SCHLESSER, G. E., and C. W. YOUNG: Study and Work Habits, *School Review*, 53: 85-89, 1945.
- SEAGOE, MARY V.: Qualitative Wholes: A Re-valuation of the Whole-part Problem, *Journal of Educational Psychology*, 27: 537-545, 1936.
- SHAFFNER, MARTHA: The Effect of Part-time Employment on the Scholarship Ratings of College Students, *School and Society*, 50: 541-542, 1939.
- SHARP, S. L.: Effective Study Habits, *Journal of Higher Education*, 14: 271-272, 1943.
- TRAXLER, A. E.: The Improvement of Study, *School Review*, 53: 286-293, 1945.
- WEINLAND, J. D.: How Successful College Students Study, *Journal of Educational Psychology*, 21: 521-526, 1930.
- WILLIAMSON, E. G.: Relationship of Number of Hours to Scholarship, *Journal of Educational Psychology*, 26: 682-688, 1935.
- WINTER, JOHN E.: An Experimental Study of the Effect on Learning of Supervised and Unsupervised Study among College Freshmen, *Journal of Educational Psychology*, 27: 111-118, 1936.
- WITTENBORN, J. R.: Classes in Remedial Reading and Study Habits, *Journal of Educational Research*, 37: 571-586, 1944.
- WRENN, C. G., and W. J. HUMBER: Study Habits Associated with High and Low Scholarship, *Journal of Educational Psychology*, 32: 611-616, 1941.

CHAPTER XXI

MEASURING THE LEARNING AND ACHIEVEMENT OF PUPILS

What to Look For. Learn about the characteristics of the essay examination and its advantages and disadvantages.

The objective, or short-answer, test is described; its advantages and disadvantages should also be studied. What are the different kinds of items in the objective test, and how are they scored?

What is meant by a standardized achievement test? What are grade and age norms or standards?

What is educational age? Geography age? Reading age? Arithmetic age?

Both educational quotient and accomplishment quotient are described. Note that one is in terms of chronological age and one in terms of mental age.

The accomplishment quotient seems very good in theory but is not satisfactory for practical use. What are its deficiencies?

How can the examination limit education but also how can it be used to stimulate learning? What good educational purposes can the examination serve?

Introduction. A group of high-school students were talking about examinations.

Mary said that she liked the essay examination better because the short-answer test pinned one down to so many details.

Jim replied, "You write a very legible hand, and the teachers like your writing, but they can hardly read mine."

"I like the short-answer test," countered Earl. "It covers the subject, and your answer is either right or wrong."

The discussion on the strengths and weaknesses of examinations continued until it was time for the examination to begin.

Examinations and Tests. Practically every teacher, no matter how progressive or what his principles of education, believes in measuring the knowledge and ability of the student in the subjects that he is studying or in the general fields that he is covering. Some teachers believe in frequent quizzes and examinations; others believe that occasional comprehensive examinations are sufficient. Teachers differ in

the extent to which they use examinations and in the kind and quality of their tests. Tests differ in their construction and in the accuracy and completeness with which they measure achievement. They fall roughly into two categories: the usual essay, or discussion, examinations; and the objective, short-answer, or "new-type," test. These may, of course, take different forms and combinations. Each type has its special virtues and weaknesses.

THE ESSAY EXAMINATION

The essay examination generally consists of 5 to 10 questions. For example, the teacher may ask, "Why is there little rainfall in the area east of and paralleling the Rocky Mountains?" "Why did the colonists revolt against the mother country?" "How do large cities obtain their supplies of water?" "Describe how a bill is made into a state law." Questions of this nature call for explanation and description and usually begin with the words *how*, *why*, *describe*, *explain*, etc. The student is asked to embody his ideas in paragraphs and sometimes in outline.

The student attempts to set forth his answer as effectively as he can, usually keeping in mind the effect that his discussion will have on the teacher. If he knows the material well, he probably writes more than he needs to, for a long answer generally makes a better impression than a short one. If he does not know all the answers to a question, he may introduce additional material, more or less relevant, to pad the answer and thus make it look more impressive.

Students often complain that the questions in an examination did not cover all the material that had been discussed. Certain topics that had been included in the daily lessons and that they had studied were not touched on by any of the questions. They also add that questions were asked about material that had not been assigned. In other words, the questions did not cover all the material in the course and covered some not included. After the examination is marked and discussed, the same students may discover that they misinterpreted one or more of the questions. They did not realize that the teacher was asking for a particular response. Had they known just what the teacher meant, they would have answered the question satisfactorily. They protest mentally, if not verbally, that they received too little credit for an answer that they think is better than the teacher judged it to be. The individual student may be rationalizing with such arguments; but, on the whole, these objections often have some validity. Factors of inclusiveness, interpretation, and judgment sometimes tend to discredit the essay examination.

Advantages Claimed for the Essay Examination. Certain advantages are claimed for the essay examination. The student is given an opportunity to express himself. Thus he can organize his materials and present them in written form as logically and completely as he is able. He is given an opportunity to evaluate the relative importance of facts and information. In doing so, it is possible for him to exercise judgment in drawing from his fund of information and practice originality in setting forth his ideas. Composition, which gives play to the imagination, initiative, powers of judgment and association, and individuality, may be regarded as valuable.

Ordinarily, the essay examination is not used in a manner that achieves such fine training. Usually the student is too hurried. He writes as rapidly as he can, putting down the answers that he thinks the teacher wants. From the standpoint of composition the examination papers are generally bad because they have been so hurriedly and carelessly written. Nor is the student encouraged to exercise his initiative by presenting his own interpretations and bringing to bear on the question supplementary, although not immediately related, facts. He does not have time to weigh facts and organize them. For these reasons, the essay examination as usually conducted does not have all the virtues claimed for it.

Still, it must not be assumed that, because the essay examination does not always produce the desired results, these results cannot be obtained. Perhaps if teachers set out to realize the virtues that are attributed to the essay examination, they could do so. If haste and carelessness cause the students to learn bad habits in composition rather than good ones, they should be given more time to devote to careful composition of their answers. They should be told that simple, direct, and accurate presentation of their facts and ideas is best. When the papers are returned, the teacher should discuss the quality of the composition and method of presentation. If the speed element is removed, the essay examination can more adequately test the student's power to present the facts and will tend to acquire the attributes that have been claimed for it. The teacher should stress good style and organization. The questions should be formulated so that the pupil is asked to interpret the facts and evaluate them. If the teacher intelligently works for the development of interpretation and judgment by means of the essay examination, good results can be achieved.

Unreliability of the Essay Test. It has been proved that the essay test, as usually constructed and administered, is unreliable. More to the point is the fact that those who mark the essay test are not always

accurate. It is, to be sure, hard for several teachers of a given subject to score the same examination and agree on its value. If they mark it independently, the values that they attach to it will vary considerably.

These objections are justified, but conditions and situations that exist do not necessarily have to exist. They are not inherent in the examination and can be remedied. If teachers would agree on standards for grading the papers and practice marking them to achieve uniformity in method, they could become more reliable and more consistent in their scoring. They not only should define the standards that guide them in marking papers but, in addition, should inform their pupils of those standards.

We must consider more than the reliability of a test. Its educational validity is most important. An examination teaches the students something. It affects their mental processes and attitudes. It may be so constructed that it trains the students in memory processes only, leading them to spend their time accumulating facts of more or less importance for reporting back at examination time. Their minds are thus confined to the narrowest limits of scholarship. On the other hand, questions can be phrased so that the pupils are directed to relate facts, apply them to meaningful problems, develop theories and principles, generalize, and speculate. In other words, questions can be thought-provoking. An examination should therefore be evaluated not only for the factual information that it measures but also for the quality of the mental processes that it brings out.

THE OBJECTIVE, OR SHORT-ANSWER, EXAMINATION

The objective, or short-answer, test is also called the *new-type test*. As a matter of fact, by now it really has been used so long that it can hardly be called new, although it is relatively recent in comparison with the essay examination. Before discussing the psychological value of the objective examination, we shall first describe and illustrate it.

It consists of various types of items or questions, such as the true-false, multiple-choice, matching, completion, best answer, and recall. It is made up of small units of information rather than of topics for discussion. We shall illustrate some of these types with facts from statistics that every student of educational psychology should know.

True-false.

Directions: In the following statements, indicate those which are true by putting a + in the parentheses and those which are false by putting a O in the parentheses:

- (+) 1. The mean is found by dividing the sum of scores by their number.
- (○) 2. The median is the highest value in the distribution.
- (○) 3. The mode is a score or value above which the number of values is equal to the number below.
- (+) 4. Percentiles enable one to describe the position of the scores of a distribution in terms of percentage.
- (+) 5. Standard deviation is a measure or unit of variability.
- (+) 6. The coefficient of correlation indicates the extent of correlation.
- (○) 7. A good sample consists of only the highest scores.
- (+) 8. A considerable number of abilities correlate about .40 or .50.

Some teachers do not hold the true-false items in such high repute as other forms of objective items, maintaining that they are less reliable; but statistical studies have shown that they are nearly as good as others. Teachers who remember their pedagogy state that a student learns the untrue by reading a false statement. Analysis has shown, however, that in this type of test the student does not learn the untrue, for he knows that some of the items are not true and therefore has the proper mind-set for them.

The modified true-false provides for supplying the words that will make the false items true. The student is asked to supply the words that if substituted for the underlined words will make the statement true.

The following three items are false, and this fact is indicated by the zeros in parentheses. Because the items are false, words are to be supplied to the right of each item by the student, and if these words are substituted for the underlined words in the item then the item will be true. For example, if *middle value* is substituted for *highest value* then the item becomes true, as the second item does, also, if *median* is substituted for *mode*. If an item is true, there are no words to supply.

- (○) The median is the highest value in the distribution. Middle value _____
- (○) The mode is a score or value above which the number of values is equal to the number below. median _____
- (○) A good sample consists of only the highest scores. representative scores _____

Great care must be exercised in preparing true-false items. Their preparation is a good exercise in writing clear, simple English. Long sentences containing several clauses may lead to conflicting interpretations. Each statement should therefore be a clear expression that is indisputably right or wrong.

The score on a true-false test may be determined as the number

right or as the score obtained when the number wrong is subtracted from the number right ($R - W$). Scoring by the rights minus the wrongs ($R - W$) gives a better range of scores for a class and thus provides better differentiation of abilities. The following outline will make clear these facts. Let us assume that there are 100 items in the test.

Number right (R).....	100	90	80	70	60	50
Number wrong (W).....	0	10	20	30	40	50
$R - W$	100	80	60	40	20	0

The range of the number right is 50, that is, from 50 to 100. The range of the scores when $R - W$ is used is 100, that is, from 0 to 100. The latter scores are a better index of the student's ability than the number right. For example, the pupils who get 50 right and 50 wrong may know nothing about the subject, because by chance there might be 50 correct and 50 incorrect answers. The person getting 50 R and 50 W should receive a score of 0, as he does when the W's are subtracted from the R's.

In the case of the pupil who gets 70 right and 30 wrong, it may be assumed that, of the 70 correctly answered, 30 were answered correctly by chance or guess. The score of 40 represents the number of statements for which the student had the correct answer. Of the other 60 he most probably guessed wrong or had the wrong answer for 30 and for the other 30 guessed the right answer. Thus, the net score is 40. It is assumed that, of the right answers, the number that are right by chance or guess equals the number that are wrong for the same reason.

Multiple-choice. In this type of test, the pupils are usually given four or five items from which to select the correct one. The following are examples:

Directions: In the following statements underline the correct answer, and write the letter corresponding to it in the parentheses at the right.

1. The mean is a measure of (a) correlation, (b) central tendency, (b)
(c) variability, (d) rank, (e) validity.
2. The median is a score of (a) position, (b) range, (c) relationship, (a)
(d) reliability, (e) regression.
3. The mode is a score or characteristic that is (a) least frequent, (d)
(b) extreme, (c) the 75th percentile, (d) most common, (e) the 25th
percentile.
4. When the pupil has a percentile rank of 60, (a) he is in the poorest (e)
quarter, (b) he is in the best quarter, (c) 60 per cent of the class are

above him, (d) he is at the median, (e) 60 per cent of the class are below him.

5. A standard deviation above and below the mean of a normal or nearly normal distribution includes approximately (a) all, (b) one-half, (c) two-thirds, (d) nine-tenths, (e) one-fifth of all the cases.
6. The coefficient of correlation is a measure of (a) relationship, (a) (b) spread, (c) regression, (d) position, (e) central tendency.
7. A good sample is (a) biased, (b) large, (c) small, (d) representative, (d) (e) skewed.
8. Academic abilities generally correlate to the extent of (a) .95, (c) (b) .70, (c) .45, (d) .20, (e) .05.

For the convenience of the scorer the student is asked to underline the correct answer and to record the number of his answer, or letter as it is in this case, within the parentheses. A paper is much easier to mark and the score is more quickly counted when the answers are in a vertical column than when they are distributed over the paper. Occasionally, the choices in some multiple-choice items have different degrees of correctness, and thus more than one answer may seem satisfactory. But where more than one answer seems acceptable, the more precise one should be selected. In scoring the examination, only the best answer is usually given credit. For example, in item 7, which asks what a good sample is, some might regard *large* as an accurate description. *Large* has some merit as an answer, but the best answer is *representative*. To be sure, large samples, on the whole, are better than small ones; but large samples may still be poor, for they may not be representative. One may, for example, test many children and not obtain reliable standards or norms for all, for the children tested may have been chosen entirely from the better districts or entirely from the poorer ones.

The Matching Test. In this test the student is asked to match, or associate, the items in the parallel columns. Because of its nature, this is also called an *association test*. The following is an example:

Directions: In the parentheses at the right, place the number of the word from the left-hand column opposite the one in the right-hand column that it most accurately describes.

1. Percentile rank	Relationship	(7)
2. Mean	$\Sigma X/N$	(2)
3. Median	Includes about two-thirds of the cases	(6)
4. Mode	The middle value	(3)
5. Range	From lowest to highest	(5)
6. Standard deviation	Measures what it claims to measure	(10)
7. Correlation	Most common value	(4)

8. Variability	Position in terms of percentage	(1)
9. Reliability	Measures well what it measures	(9)
10. Validity	$\sqrt{\sum fx^2/N}$	(6)
11. Skewness	Generally the most reliable measure of variability	(6)
12. I.Q.		
13. Frequency distribution		
14. Regression		

It is well to have more items in one column than in another; otherwise the pupil can first eliminate those of which he is certain and then guess correctly more of the remaining ones than he can when there are several that are not matched. Another variation is to have two items in the right column that refer to a single phrase. In the sample test given here are two phrases and a formula for item 6. The three items in the right column that are to be associated with standard deviation, or item 6, are (a) Includes about two-thirds of the cases, (b) Generally the most reliable measure of variability, and the formula $\sqrt{\sum fx^2/N}$. The matching, or association, test is generally used for names, terms, definitions, dates, titles, etc.

The Completion Test. This test can be devised in different forms or variations, as can most of the other types of objective-test items. The following are examples:

Directions: In the column of numbered blank spaces, write the words that make the sentence true. The number in the sentences and the column should correspond.

In a normal distribution, (1), (2), (3) are equal.

The (4) of correlation indicates the extent to which variables

are (5), etc.

- | | |
|----------------|-------|
| 1. Mean | _____ |
| 2. Median | _____ |
| 3. Mode | _____ |
| 4. Coefficient | _____ |
| 5. Related | _____ |

The completion test may also be devised so that the answers are included in a column (see below). The object is to select the correct answer and write it in the appropriate blank. This form of the test is called a *controlled-completion test* and has some of the elements of the matching test. The following is an illustration:

Directions: In the blank spaces at the right of the page, write down *in order*, for each letter, the number of the word in the left-hand column that is necessary to complete the sentence.

1. Normal curve	In normal distribution, the (a), (b), and (c) are equal. The (d) of correlation indicates the extent to which variables are (e).	a. <u>2</u>
2. Mean		b. <u>4</u>
3. Correlation		c. <u>7</u>
4. Median		d. <u>6</u>
5. Related	A test of perseverance has (f) if it actually measures perseverance, etc.	e. <u>5</u>
6. Coefficient		f. <u>9</u>
7. Mode		g. <u> </u>
8. Regression		h. <u> </u>
9. Validity		i. <u> </u>
10. Skewness, etc.		j. <u> </u>

In this type of completion exercise the student selects answers from a list made available to him, and thus the complications in scoring that arise from the use of synonyms are avoided. Some educators may object to this version, on the grounds that, since recognition is easier than recall, the test is providing too many props, that in a sense it is doing much of the student's thinking for him rather than indicating his independent grasp of the facts in the course. They feel that it may lead him to depend too much on a vague feeling of familiarity with terms. In some cases, however, it is necessary to provide the best possible terms in order to prevent overlapping of terminology or the complications of alternative answers.

Possibly the most common form of the completion test is the one in which there are blanks in a sentence instead of words. The student is asked to write in the words. The following sentence is an example:

In a normal distribution the _____, _____, and _____ are equal.

The advantage of the other two forms of the completion test lies in easier and probably more accurate scoring.

The Recall Test. This test is like a completion test to the extent that answers must be provided to complete the sentence. It differs in that one or two words are to be recalled for each sentence and are generally to be written in at the end of the sentence. The following four examples are illustrative:

Directions: In each sentence, fill in the blank with the word necessary to complete the sentence.

1. When a test measures well that which it measures, it is _____.
2. The distance from the highest to the lowest score is the _____.

reliable _____

range _____

3. The score above and below which the number of scores is equal is the _____. median
4. A systematic organization of the scores according to class intervals is called a _____. frequency distribution

The Classification Test. The items in this form of test are selected so that in each part all but one will fit in with the rest. All but one classify together according to a logical basis, and the one that does not is to be selected and its letter recorded in the parentheses.

Directions: In each of the following groups, all the words except one can be classified together. In the parentheses at the right, place the letter representing the word that does not logically fit in with the others.

1. (a) mean, (b) correlation, (c) median, (d) mode, (e) 50th-percentile (b) rank.
2. (a) 40th percentile, (b) median, (c) q_3 , (d) q_1 , (e) standard deviation. (e)
3. (a) correlation, (b) skewness, (c) correspondence, (d) relationship, (b) (e) association.

There are other forms of variations of the types that have been presented, and there are other types of exercises, such as analogies or arrangement of items according to a common quality.

The preparation of a good objective test requires a high order of skill and considerable time. It is necessary to try it out in order to remove unsuitable items and to add others. Even when a test has been perfected, so to speak, it should not be used for too long a time, for it will tend to fix the course content as well as the teaching method. Examinations should be changed often in order not to retard curricular changes or to routinize the teacher's technique.

A good way to avoid an inordinate amount of work in preparing examinations is for the teacher of a given subject or department in a school system to keep a card file of examination items. New items should be added to keep pace with new material and obsolete items removed to a dead file. Alternate forms of items should be filed, also. The teacher can then make up relatively fresh examinations with a minimum of labor as the need arises.

Anyone wishing to investigate this subject in greater detail or making a special study of examinations may consult some of the references given at the end of this chapter. In fact, all teachers should make a study of the methods and techniques of the objective examination and should experiment in the construction and use of tests.

EVALUATION OF THE OBJECTIVE, OR SHORT-ANSWER, EXAMINATION

Claims have been made for the objective examination that indicate a tendency to overvalue this newer type and to depreciate unduly the older essay examinations. It is characteristic of those working in education and psychology to overrate the recent innovations and undervalue the older methods. But even though the advantages of objective examinations may have been overemphasized, they have some distinct merits that argue for their extensive use.

Desirable Features of the Objective Examination. The objective examination handicaps the bluffer, for he is called upon to give precise and definite answers. It holds the pupil to the point, and he cannot avoid it. Though he may wish to interpret the question loosely and write about other aspects of it, the objective test, by limiting the number of possible answers, does not permit this kind of evasion. It is an excellent device for testing a student's knowledge of the factual elements in a subject. In every course there are certain fundamental facts that the student should learn. The extent of his knowledge of such a body of facts can be better tested by an objective test than by the essay type.

The objective feature of the true-false, matching, completion, and multiple-choice items has real significance. These items can be accurately scored. The score that a student obtains on a comprehensive objective test indicates how much he knows in the field in which he was tested. It has a definite meaning in terms of the score of other students in the class. The student sees his relative standing and accepts the results of the test, and he feels that he has been marked fairly. The instructor, too, can feel more confident of the fairness of his marking standards. The objective test is free from the influence that personal prejudices arising from the pleasant or unpleasant relationship of the pupil and teacher have on school marks.

One of the features that has made the objective type of examination popular is the ease with which it can be scored. By means of lists of answers recorded on cardboard strips, or by scoring keys which fit the column of answers on the examination blanks, the scoring can be done very rapidly. In some tests the answers may be recorded by the students on small cards, which can be rapidly scored. Then the same examination blanks can be used over and over again, and the scoring can be turned over to a clerk or an assistant.

The objective test can cover the material of an area or field more completely than the subjective test can. In other words, the objective

examination can sample the course materials more thoroughly. Because of the many items in the objective test, no large section of subject matter is omitted. The student can no longer complain that some parts of his preparation were not even touched by the test. The sampling is improved by the variety in the nature of the test forms, which give different approaches to the subject matter.

In short, it may be said that the objective test is a reliable measure of achievement. It tests well the extensiveness of the student's knowledge and information. A good basis is thus provided for accurately determining the mark that the pupil has earned.

Disadvantages of the Objective Test. Notwithstanding its advantages, however, the objective test is deficient in several important respects. Generally, it is limited to the more factual elements of the course. It stresses the meanings of terms, definitions, opinions, and quantitative materials. All this may be well and good if the examination is limited to facts and information that are significant. Often, unfortunately, it includes details whose educational value almost anyone would question.

In order to keep the test as objective as possible, questions or items are omitted for which no one incontrovertible answer exists. Therefore, some of the best material in literature, history, sociology, and other subjects must be excluded because it is speculative and hypothetical. Whatever is controversial in nature is also omitted, for a satisfactory key can hardly be made for a test when there is doubt about many answers. Consequently, as objective tests are now generally made, the questions are limited to those for which no disagreement can arise about the answer. Furthermore, these tests are better for subjects which are quantitative in nature than for those which are descriptive and involve more speculation and evaluation. The latter subjects require the discussion of facts in their relation to each other rather than the recognition of items in comparative isolation.

The usual objective examination does not provide an opportunity for the student to do independent and original thinking. The feature of this form of examination that keeps the student from bluffing also prevents the good student from speculating and expressing whatever original points of view he might have. The objective examination does not encourage original intellectual explorations by the pupil.

The objective examination causes the student to study in a manner that is not conducive to high scholarship. (The essay examination may be almost as faulty in this respect.) He adjusts his studying to the examination question that he anticipates. In class, he listens to the

teacher to note whether or not she says anything that she may later ask in question form in an examination, and he writes down what he thinks will help him in this. In reading, he checks only the items or facts that he thinks will be called for, and he becomes a hunter for bits of material. He does not try to coordinate these fragments into a pattern, for this will not help him in his tests. Just before the examination, students frequently gather together to "try each other out" on numerous more or less isolated facts that they think will be useful. They memorize all sorts of informational bits. Cramming has not been reduced by the objective test but has rather been accentuated by it. Our students are becoming "bit pickers" rather than reasoners, inquirers, and learners.

In an investigation of the effect of type of examination on method of preparation and efficiency in learning, it was discovered that the method of preparation did differ with the characteristics of the examination. About three-fourths of the students were conscious of preparing differently for the four types of tests. For true-false and multiple-choice tests, emphasis was placed on rote memorizing of more or less isolated items and details. In preparation for the essay and completion test or the recall type, more emphasis was placed on the organization and summarizing of material. The results indicated that a method of study emphasizing organization of material resulted in a better command of the subject as tested by all four types of examination that were used.

These findings point out the dangers lying in the control that examinations can exercise over educational methods and procedures. For example, if examinations of certain types are given state-wide under the auspices of the state board of education or similar sponsorship, they may tend to control both the study habits of the pupils and the teaching methods of the teachers. Examinations on a state-wide basis may be objectionable on several counts; but if they emphasize limited bits of information, scrappy facts, and unrelated details, they are objectionable because they cause teachers to narrow their teaching to relentless drill and the pupils to learn, without questioning, many bits by rote. Instead of organizing, relating, and evaluating, they store up prospective answers for the examination. Examinations at all levels, from the elementary grades through the graduate school, may either restrict or expand the educational processes. They may cause the thinking processes to be narrowly confined, or they may stimulate originality and creativeness. The results of the different types of examination influence learning in different ways.

These evils are not necessarily inherent in the objective examination

any more than the deficiencies attributed to the essay examination are inherent in it. If teachers decide to devise their examinations so that they stress judgment, analysis, evaluation, and original reactions, many of them can succeed in doing so. But the task is a very difficult one, a fact that accounts for the make-up of most objective tests and their stress on memory. The thing to bear in mind, however, is not to accept meekly conditions that can be improved but to set about making the desirable changes.

THE STANDARDIZED ACHIEVEMENT TEST

The standardized achievement test differs from the typical objective test not in form necessarily but in extensiveness. Most standardized achievement tests are designed for grade- and high-school use to measure pupils' achievement in reading, geography, arithmetic, chemistry, geometry, and other subjects.

Standardized achievement tests are generally given at the end of the year to measure the level of the pupil's achievement in his subjects. His score is compared with the average achievement score for his grade and age; thus, his relative status in various subjects can be determined.

Standards and Norms. Good standardized tests should be constructed so as to include a thorough sampling of the subject matter in history, geography, arithmetic, or whatever the subject may be. Furthermore, in its preliminary forms, the test should be given extensively to children who represent a good sampling of all abilities in order to obtain norms, or standards, for pupils of various grades for each of the subjects. For example, the average score of third-graders in a reading test would be made the standard, or norm, for that grade. Similarly, the average scores for fourth-, fifth-, sixth-graders, etc., become the norms for those respective grades.

Thus a teacher can compare the average score of her grade with the standards to determine whether or not her class measures up to the established subject standards for that grade. In addition, the grade status of individual pupils can be found from the norms. For example, some fifth-grade pupils have sixth- and seventh-grade ability or even higher. There will also be some under their norm, equal to only third- or fourth-graders, or, in a few instances, even lower.

Age norms of achievement tests are established for a range of ages in the same way as they are established for grades. The average achievement for eight-year-olds on the preliminary tests is made the norm for that age. In order that the norm may be accurate, the eight-year-olds to whom the test is given must be carefully chosen so that their

ability is average eight-year-old ability. If too many bright or too many dull children are chosen, the norm will be either too high or too low, and similarly with other ages, nine, ten, eleven, etc. By means of age norms, one can discover whether or not the pupil is "at age" in his various subjects or the number of years that he is above or below his age in achievement.

There may be several reasons why age and grade norms may not fit the pupils in some schools. It may be that the test does not adequately sample the subject matter of the courses of those schools which include material different from that in the tests. Furthermore, the grade placement of course material may vary from school to school. Those schools which introduce a subject earlier in the course of study are more likely to equal or exceed the norms than the schools that introduce the same material later. A definite tendency exists in some schools to delay the teaching of certain material, especially lower-grade arithmetic. Arithmetic formerly taught in the first and second grades is now being taught in the second, third, and fourth grades. Changes such as these dislocate age and grade norms based on a former grade location of materials. The promotion policy of a school also affects the grade norms and to some extent the age norms. The school that fails a larger proportion of its students will tend to have more capable students in its upper grades than one that passes most of its students. Two such schools will vary in their tendency to equal or surpass grade and age norms.

A danger of the standardized test is the effect that it may have on teaching and on school policies. Sometimes, where these tests are in use by many schools, the teacher in an effort to have her class make a good showing directs all her instruction toward preparing her pupils for the examination. She and the students thus tend to be limited to the content of the tests. Administrators may be equally guilty in allowing their concern for their schools' high achievement on the standardized examination to "freeze the curriculum" and control subject content for various courses. If they do not stress competitive standing on these tests, the latter will not have a constricting effect on the teaching processes. The learning of the child need not, therefore, be dominated by the standardized test but can be stimulated by it.

Educational Ages and Educational Quotients. We have explained how pupils of a given age may vary in achievement from an age norm far below their age to one far above it. Thus, we have ten-year-olds with the arithmetic ability of average seven-, eight-, nine-, ten-, eleven-, twelve-, thirteen-, and fourteen-year-olds; the range may even be greater.

The ten-year-old who is equal in his arithmetic ability to a seven-year-old is said to have an arithmetic age of 7; one who is equal to an eight-year-old, an arithmetic age of 8; etc. Comparably, a pupil also has a reading age, history age, and geography age and ages for other subjects. His general educational achievement determines his educational age, which is symbolized by the letters E.A. This E.A. is to general ability in school subjects as M.A. is to general mental ability. E.A. is determined by one's composite achievement in a test of several subjects.

E.A. may be equal to life age, or C.A., or may be less or higher. The quotient used to indicate the relationship of E.A. to C.A. is known as the *educational quotient* (E.Q.). It is found by dividing E.A. by C.A. and multiplying by 100, that is, $(E.A./C.A.) \times 100$.¹ A child whose E.A. and C.A. are equal has a quotient of 100, which is average. A boy ten years old whose achievement is equal to the average for his age has an E.A. of 10 and an E.Q. of 100 ($10\frac{1}{10}$). The E.Q. of a pupil twelve years old who has an E.A. of 9 is $\frac{9}{12}$, or 75. An eight-year-old with an E.A. of 10 has an E.Q. of 125, or $1\frac{1}{8}$. The E.Q. indicates the achievement status of a pupil in terms of the relation of his C.A. to the average for that age.

Quotients can also be calculated for the pupil in each of the various school subjects. By dividing his geography, arithmetic, history, reading ages, etc., by his C.A., a geography quotient, arithmetic quotient, history quotient, reading quotient, etc., will be obtained. The standing of a pupil in various subjects can be compared, and thus his strength and weaknesses observed. Such observation provides an opportunity to help him. If a pupil is particularly strong in history, for instance, special attention may be given to increasing his interest in the subject. Weakness in a subject indicates a need for assistance, but it is scarcely wise to devote so much time to teaching the child in his weak subjects that his strong ones are neglected. This topic has been taken up at some length in other pages.

Accomplishment Quotient. Another quotient used by educators involves educational age and mental age. It is called the *accomplishment quotient* (A.Q.) and is calculated by dividing the E.A. by the M.A. ($E.A./M.A.$). Accomplishment is evaluated in terms of M.A. rather than C.A., as in the case of the educational quotient. It will be pointed out later that the accomplishment quotient has some serious limitations.

¹ Although the formula is $E.Q. = (E.A./C.A.) \times 100$, in general practice here, as in I.Q., the multiplication by 100 is assumed rather than expressed in the formula. In the cases that follow, the quotients are, strictly, 1.00 and .75, 1.25, but the decimal point is usually ignored.

According to this concept, children are expected to achieve in terms of their mental capacity rather than their age. A twelve-year-old boy with an M.A. of 10 cannot be expected to do so well in his subjects as a twelve-year-old boy with an M.A. of 14 and, of course, will rarely do so. Theoretically, the achievement of the boy with an M.A. of 14 should correspond to that of average fourteen-year-olds, and correspondingly for the boy with an M.A. of 10. The A.Q. is intended to indicate whether or not a pupil achieves up to his M.A.

A pupil with an M.A. of 10 should have an achievement age of 10; but if he is more than average in the diligence and the effectiveness with which he studies, he may have an E.A. above 10. If, however, he is indolent or is under average in the effectiveness of his study methods, his E.A. will be less than his M.A.

According to this method, a pupil whose E.A. and M.A. are equal has an A.Q. of 100. A pupil whose E.A. is under his M.A. has an A.Q. under 100. A pupil whose E.A. is above his M.A. has an A.Q. above 100. It is assumed that the pupil who has an A.Q. of 100, or approximately that, is achieving what is expected for his mental capacity; one who has an A.Q. above 100 is doing correspondingly better; and one whose A.Q. is below is not living up to his capacity.

By way of summary, it may be said that the general theory behind the A.Q. pertains to achievement in terms of a pupil's capacity. It assumes that capacity for achievement is determined by M.A. as indicated by an intelligence test. Thus, a boy with an M.A. of 12 and an E.A. of 10 or an A.Q. of 83 needs to be spurred on to work harder so that his achievement will approach his mental power to achieve. The A.Q. can be calculated for individual subjects, also, and diagnosis of potential capacity made on the subject basis.

Deficiencies in the Accomplishment Quotient. Superficially, these concepts are good enough. They seem sound and have a scientific flavor. We apparently have a means of determining by measurement whether or not students work up to their capacities, and we should be able to adjust ourselves to individual differences by expecting that each pupil work only up to his capacity.

Actually, however, the A.Q. is not sound and does not work out in practice. In the first place, the A.Q. is a ratio with a numerator and a denominator. An error will nearly always occur in each, most frequently small but sometimes large. If the errors in the E.A. and the M.A. are fairly large and in opposite directions, the A.Q. will be badly in error. For instance, if the true A.Q. is $\frac{8}{7}$, or 114, but the obtained E.A. is 7 and the obtained M.A. is 8, then the A.Q. becomes

$\frac{7}{8}$, or 88. The A.Q. has been changed 26 points by the opposite change of E.A. and M.A. of only 1 year. Errors of one sort or another and even those due to the unreliability of the tests cause the A.Q. to be an inaccurate measure of the achievement of individual pupils according to capacity. The A.Q. is a more dependable measure for groups but here, too, is not entirely satisfactory.

Another deficiency of the A.Q. is the fact that it favors the dull pupil and penalizes the bright. For example, the A.Q.'s of dull twelve-year-olds with an M.A. of 10 will be higher than the A.Q.'s of bright twelve-year-olds with an M.A. of 15. According to the theory of the A.Q., the dull twelve-year-old has to work up to an M.A. of 10, but the bright pupil has to work up to an M.A. of 15. The bright boy has hardly had an opportunity in school to bring up his achievement proportionately, for promotions are made, for the most part, not according to M.A. but according to C.A.

The point may become clearer if we take two boys of the same M.A. John and Richard both have an M.A. of 10, but their C.A.'s are 8 and 12, respectively. Because the eight-year-old is bright and the twelve-year-old is dull, each has the same M.A. Yet because the younger boy has been in school 4 years less than the twelve-year-old boy, he consequently has not had an opportunity, as the educational system now functions, to bring up his achievement to the same level as that of the duller boy.

There are other conditions, also, that prevent the A.Q. from realizing the advantages that some writers ascribe to it. The A.Q. is very undependable, and its apparent virtues are destroyed because of the variation of several factors—tests, school curriculum, and promotional policies—on which its validity is based. Nevertheless, it is well to know about the A.Q. if only because it has been seriously set forth as an index to achievement according to capacity. Because of its deficiencies, however, it does not deserve wide application. The principles that prompted so much interest in the A.Q., on the other hand, are fundamental, and we should work toward their attainment.

THE EXAMINATION AND EDUCATION

It is generally maintained that the examination, whether objective or subjective, is an instrument for measuring the pupil's learning and achievement in his school subjects; and the value of an examination is generally analyzed from this point of view. The examination, however, may prove to be more than this. It may operate in a number of ways, and thus it does much to shape the nature of the education that a

child receives. First of all, it can be used as a whip to make the pupil do his work. The test is given to check on how carefully he has done it. He is thus trained to work for examination results.

When the student asks the teacher, "Shall we need to know this for the examination?" we have evidence of the control that the examination has over the pupil. For example, a teacher in expanding a point deviated a considerable distance from it. A boy in the class raised his hand and said, "What has this got to do with the entrance examination?" It is true that one should not as a regular practice stray far off into the remotely illustrative or speculative, but a system of examination that holds pupils and teacher to a very narrow course is not good educationally.

Again, the examination may be used to measure achievement, to indicate the proficiency of the student and the quality of his scholarship. The test results may be used to guide the student in his school career, and they are therefore useful in a practical way. As a guide, the examination is an important instrument, but it should not be used too often. Carefully devised comprehensive examinations given once a year, or even at the end of the elementary school or high school, will adequately determine the achievement status of individual pupils. Such an examination, requiring several hours, will serve as a better index to what the pupil has learned than all the marks on his high-school report cards. It will assess his various abilities well and give a good basis for guiding them. But though examinations need not be used frequently to determine the level of pupils' achievement, they should be used often for instructional purposes.

The examination may, for instance, serve an educational purpose. To fulfill this objective, it should be so devised and so used that it promotes the pupil's education. The teacher gives it not to coerce the student to work but with the understanding that no marks will be based on it and that it is intended to help the student discover his strength and weakness. We might call this approach the *diagnostic process*. The student will be guided in his studying by the results of the examination, and the teacher will help him with his particular difficulties. For this purpose, examination should be used frequently. It is then a teaching instrument.

Finally, tests may be used to organize and integrate knowledge. They can be made more comprehensive in scope so that the student will have an opportunity to bring information from many fields to focus on a given problem. Generally, examinations are based on a part of a course or, at the most, on a whole course. Instead, they should be

devised to cover a large body of knowledge and thus to encourage the student to integrate his ideas and not isolate them from one another. Thus, the examination over the larger areas of learning should be used not merely to measure, like the term test, which the student does not see again, but to help the student see the interrelationships of the various fields of knowledge and to aid him to strengthen himself in the respects where it has revealed that he is weak. The test thus becomes a valuable part of the educative process.

SUMMARY AND REVIEW

Students should be tested in order to determine their abilities and progress.

The essay examination is the usual examination. It requires expository writing in answer to questions, which usually begin with the words *describe, what, explain, why, or how*.

The essay examination is hard to evaluate accurately. If the teacher establishes standards for each question to guide her when she evaluates the answers, she will do so more reliably.

The essay examination gives the student opportunity to exercise his originality, but he may also "bluff" by writing much about nothing.

The objective, or short-answer, examination takes much more time to prepare than the essay but is more easily and accurately scored. It consists of a number of items: multiple-choice, true-false, matching, completion, recall, and a classification test. The short-answer test can be devised so that it covers the subject comprehensively, but it has a tendency to cause students to study "bits" rather than relate and integrate knowledge.

The standardized achievement test has the objective, short-answer type of items and is an objective test for which age and grade norms or standards have been established. By means of the standardized test a child's achievement in the various school subjects can be evaluated in terms of averages for different ages and grades.

Because the achievement and intelligence tests yield educational and mental ages, quotients involving these ages and chronological age can be calculated. These are called *educational quotients* and are obtained by dividing achievement ages by chronological age. The accomplishment or achievement quotient is obtained by dividing achievement ages by mental age.

The accomplishment quotient is not of practical use, for it is not applicable to students of the same mental age who differ in chronological age.

The examination can be used to make a student work, as a basis for determining his marks, and as a means of helping him ascertain what he knows and does not know. The last-mentioned purpose is the best educationally, for thus the examination becomes a teaching instrument.

Test Your Thinking

1. Name the advantages and disadvantages of the essay test.
2. Explain how the essay test can be prepared and used so that it is most effective.
3. Describe the general make-up of the objective, or short-answer, test by naming the various types of items that are found in it.
4. What are the desirable and undesirable features of the objective test, and how can it be used to yield the most good?
5. How does the standardized achievement test differ from the objective test that the teacher constructs for his own use?
6. Explain what educational ages are.
7. A child 9 years 2 months old has an E.A. of 11 years 11 months. What is his educational quotient? Interpret this quotient.
8. A child with an M.A. of 8 years 5 months has an E.A. of 8 years 6 months. What is his accomplishment quotient? Interpret.
9. What are the weaknesses of the accomplishment quotient?
10. How can the examination be used to contribute most to the education of the child?

References

- GREENE, H. A., A. N. JORGENSEN, and J. R. GERBERICH: *Measurement and Evaluation in the Elementary School*, Longmans, Green & Co., Inc., New York, 1942.
- GREENE, H. A., A. N. JORGENSEN, and J. R. GERBERICH: *Measurement and Evaluation in the Secondary School*, Longmans, Green & Co., Inc., New York, 1944.
- GREENE, H. A., and A. N. JORGENSEN: *Use and Interpretation of Elementary School Tests*, Longmans, Green & Co., Inc., New York, 1935.
- GREENE, H. A., and A. N. JORGENSEN: *Use and Interpretation of High School Tests*, Longmans, Green & Co., Inc., New York, 1936.
- LEE, J. MURRAY, and PERCIVAL M. SYMONDS: New-type or Objective Tests: A Summary of Recent Investigations, *Journal of Educational Psychology*, 24: 21-38, 1933.
- LINCOLN, E. A., and L. L. WORKMAN: *Testing and the Uses of Testing Results*, The Macmillan Company, New York, 1935.
- LOWELL, A. LAWRENCE: Examination in the Educational Process, *Howard Teachers Record*, 3: 183-188, 1933.
- MC CALL, W. A.: *Measurement*, The Macmillan Company, New York, 1939.
- MEYER, GEORGE: The Effect on Recall and Recognition of the Examination Set

- in Class Room Situations, *Journal of Educational Psychology*, 27: 81-99, 1936.
- MOORE, C. C.: Relative Judgment in Pupil Ability Ratings, *Journal of Genetic Psychology*, 55: 443-446, 1939.
- ORLEANS, JACOB: *Measurement in Education*, Thomas Nelson & Sons, New York, 1937.
- REMMERS, H. H., and N. L. GAGE: *Educational Measurement and Evaluation*, Harper & Brothers, New York, 1943.
- RINSLAND, HENRY D.: *Constructing Tests and Grading*, Prentice-Hall, Inc., New York, 1937.
- ROSS, C. C.: *Measurement in Today's Schools*, Prentice-Hall, Inc., New York, 1947.
- WEBB, L. W., and A. R. M. SHOTWELL: *Testing in the Elementary School*, Rinehart & Company, Inc., New York, 1939.

CHAPTER XXII

REPORTING THE ACHIEVEMENT AND ADJUSTMENT OF PUPILS

What to Look For. Focus your attention on the importance of marks in the minds of students and their concern about the basis on which they are marked.

Learn why the basis for giving a mark in a subject should be the achievement in that subject.

Acquire some facts about the different ratings that teachers give the same lessons.

It is pointed out how the standards of marking vary from department to department and from school to school. The reader should acquire a number of ideas about this variation, which may be justifiable or may not.

Learn the various reasons for marks being very important.

How can a standard distribution of marks, sometimes referred to as a *normal curve*, be a helpful guide in distributing marks?

What factors should be taken into account in determining the percentages of the various marks?

A number of reasons are given for changing the marking and report-card system that now prevails. Note especially the arguments to the effect that the marking system has a bad influence on real education.

Learn how a better system of reporting a pupil's successes, failures, adjustments, or maladjustments can be of greater help to pupil, teacher, and parent.

What philosophy should control the teacher's evaluation of the pupil?

SCHOOL MARKS

Introduction. A few weeks after sending in the semester marks, a university professor received the following letter from a member of a class that had consisted of schoolteachers. The letter is presented here because it raises several questions about principles and standards of marking.

Dear Sir:

Some day when you have a bit of leisure, will you please tell me precisely what one must do or leave undone to earn an A in your courses? I was valedictorian of my high-school class and a special honor graduate from _____

Normal, so it piques me to draw tepid B's—especially in courses on which I devote as much time and work as I did for yours. Perhaps you can suggest more efficient methods for organizing the vast amount of reference material you submit.

But, after all, how did you judge the extent of my knowledge in the course in Mental Tests? I know you approve the modern clamor for attention, but it's a bit unfair to those who, like myself, are by nature reticent, especially in classes where obvious deference is paid to certain gray hairs and, paradoxically, to effeminate, eighteenth-century fidgeting. It seems I must join the gushers to draw the A's—those spouters who think any kind of talk goes as long as it is sufficiently vacuous and irrelevant; who boast of their open minds, when as a matter of fact, they are often merely vacant. Yes, silence is golden, but frequently the gold goes to those who have brass enough to speak up. Then, again, your distribution of marks may be based on economics, which, according to *Mercury*, knows no right or wrong.

I know, too, that you objected, to the point of sarcasm (for which, I learned from Professor _____, the classroom is no place), to my being late for two or three classes—but how could I know when you would be on time? Waiting for dilatory instructors is the favorite enemy of my Viking disposition.

Call this rationalizing or what you will; I thank you for any help you can give me.

Yours expectantly,

It may be said in the vernacular that this student put her instructor "on the spot."

A phase of education that weighs heavily on both teachers and pupils centers in school marks. Teachers spend an enormous amount of time and energy in marking the achievement of their students, who are seriously concerned about marks, all the way from the kindergarten through the graduate school. Teachers arrive at these marks according to more or less clearly defined educational and psychological principles, and the students react to the marks that they receive with feelings that range along the whole emotional scale from greatest satisfaction to the impulse to commit suicide.

Students have a right to know on what basis their marks are determined. The writer of the letter quoted implies that, at least in one instructor's courses, activity in class, deference to the instructor, promptness in arriving at class, and sarcastic expressions influenced her mark. What should be the standard for determining the grades¹

¹ Possibly the term *grade* should be reserved for indicating the school grades (fourth, eighth, tenth, etc.) that a pupil is in; and the term *mark* for indicating the quality of a lesson or the work of a period or semester. Grade and mark have such extensive use as synonyms, however, that they will be so used here.

that pupils are given by their teachers? Should they be based on the efforts and earnestness of the students, their mental capacity, good or bad behavior, achievement and accomplishment, or on other factors? In view of the many conditions influencing teachers in grading students, almost as many different standards exist for determining school marks as there are teachers.

Standards for Marking. To illustrate this topic, reference will be made to a certain man's response to his son's achievement in arithmetic. This father had obtained some standardized arithmetic tests, which he gave to his son, thus discovering that the boy was below the standard for his grade. The man recalled seeing A's in arithmetic on his son's report card. The inconsistency between his son's achievement on the standardized test and the mark on his report card caused the father to do what some interested parents do when certain questions come up—go to see the teacher.

He explained to the teacher that he had discovered by means of arithmetic tests that his son did not know as much as she had indicated by the A's on his report card. She admitted that his son was not the best pupil in arithmetic; there were several who were better, but she emphasized the fact that no boy in class was a better citizen, tried harder, was prompter in handing in his work, or showed a better attitude.

The father replied, "My chest swells more with the pride of knowing those facts about my son than it would if he were the best in arithmetic, but you have been fooling me. You have been telling me by those A's on my boy's report card that he is excellent in arithmetic; and now I find out that, as a matter of fact, he isn't."

The marks in a subject should have a reliable meaning; they should represent a student's achievement in that subject—his status in terms of knowledge, ability, skill, or accomplishment in it. An A in geography should represent that quality of attainment in geography. The highest marks should be given to those who have satisfactorily demonstrated the greatest superiority, and the lowest to those who show that they are least proficient. Those between the best and poorest should be distributed according to the degree of excellence between the two extremes of achievement.

Many teachers will protest that some students try hard and should be rewarded for their efforts. They argue that if the sincere, industrious students of low capacity get grades determined by their ability in a subject they will be discouraged and lose interest; their valuable trait of perseverance will thus be destroyed. Other teachers insist on grading according to the improvement that individual pupils have made in their

subjects. A pupil who is only average at the beginning of the year but improves his position so that he becomes one of the better ones deserves a high mark. Similarly, if a pupil starts at a low level of achievement according to the standard of the class and works himself up to the average, he also deserves a good mark.

All these points of view have validity. Attention should be given to the development of desirable traits and the prevention and discouragement of undesirable ones. The teacher who thus has the development of the pupil's personality in mind is to be commended. Nevertheless, there should be a better way of accomplishing this purpose than making a mark for a given subject a composite of varying proportions of achievement, improvement, initiative, effort, attitude, regularity of attendance, etc.

The way to avoid making a mark in any subject a symbol of conglomerate achievement and various degrees of other excellences is to rate achievement and the other traits separately. The mark in history, for example, should represent attainment in that subject, and the other traits should be rated individually. If teachers of a school system wish to judge their students according to their growth in a subject, their industry, activity in class, initiative, and any other qualities, they should enter separate items on the report card and rate the pupils in those traits as carefully as possible. By this plan the several ratings and opinions of the teacher are recorded separately and not merged in a mark whose meaning may be misleading.

One instructor in talking to his students put it this way:

"When I mark you, I shall give you a mark that represents what you know in this mathematics course according to the examinations you have taken. Whether you have been tardy or not or shown a nice attitude or laughed at my jokes won't matter one bit when I give you your marks. They will be based entirely on what you know in mathematics."

"But when I am asked about you or asked to recommend you for college or for a position, then I shall discuss how industrious, cooperative, and helpful you are. Then I shall lay great stress on your qualities of character and personality. Your personal qualities are very important, and I am very much concerned about them, but when I mark you in mathematics I shall mark you only on your achievement in mathematics."

Variability in Marks among Teachers. Another source of unreliability in grading is found in the uncertain standards of the individual teacher. An A, for example, obtained from one teacher may not represent the same degree of attainment as an A from another. Further-

more, the mark that the teacher gives may be based on standards different from those determining the same mark for another student. From time to time, teachers differ in their evaluations of a certain pupil's themes, arithmetic papers, drawings, and examinations. If, for instance, a large group of typical English teachers should rate the same theme, a few would probably mark it a failure, a few would mark it superior, though the great majority would give the theme approximately the same rating.

The great variability in the marking method of any one teacher has been established by a number of investigations. Variability in marking standards characterizes teachers of all subjects. Arithmetic teachers, for instance, may say that they know how to mark their papers because arithmetic is exact and precise. Investigation has shown, however, that teachers differ as much in their evaluation of an arithmetic lesson as they do in evaluating almost any other subject.

Briefly reviewed are several studies by Rinsland,¹ which indicate that teachers differ in marking papers and that their marks are unreliable. A paper in English was marked by 142 teachers, and the marks ranged from 50 to 98 per cent. When 114 teachers marked a geometry paper, the range was from 28 to 92 per cent. Similar variation was characteristic of the marks given history and arithmetic lessons, also.

Furthermore, students soon learn that teachers differ among themselves in their marking. They learn that some teachers are easy markers and others hard. The general characteristics of their grading methods are soon learned; and in high school and college, where students may elect subjects, they take into account their likelihood of getting a good grade by virtue of the instructor's standards of marking.

By turning in themes or drawings that have been used before, students have learned that instructors are inconsistent in their marking. Students have discovered from experience that a theme, for instance, which has been marked and returned may be submitted in corrected form by another student at another time and get a lower mark than it received originally. One student removed the mark from a drawing of goldenrod made by a student in the class the previous year and submitted it again. Receiving a lower rating on it than the other student had received, he remarked, "Teacher must have been suffering from her hay fever when she marked the goldenrod this year." Such incidents do not increase student respect for the justness and reliability of marks.

¹ RINSLAND, HENRY D., *Constructing Tests and Grading*, pp. 2-11, Prentice-Hall, Inc., New York, 1937.

Variability among Departments. Standards vary not only with individual teachers but also with departments. The proportion of the various marks A, B, C, etc., or their equivalents differs considerably in the departments of the same school. In some schools, it is easier to get a good mark in the social sciences than in mathematics. In others, the language departments give fewer good marks than any other department. Under such conditions, the interpretation of grades by any reasonably consistent standard is practically impossible.

Differences among subject-matter fields and departments are found in high schools and colleges. In one college, for example, 20 per cent of the students were failed in the mathematics department, whereas in religious education less than 2 per cent failed. In the same university, 45 per cent of the students got A in art, and only 7 per cent received A in psychology. Someone, on seeing the distribution of marks for the various departments, suggested that the football coach should have this information so that some of his players could be guided into courses in which they would be almost sure to get marks which would keep them eligible for football.

Variation from School to School. Schools, too, differ among themselves in the percentages of the various marks that they give. Some give more marks indicating superior achievement than do others; likewise, some give more representing inferior attainment.

Of greater significance is the fact, based in part on variation in marking students, that a mark earned in one high school or college does not indicate the same absolute standard of achievement as a mark earned in another similar school. For example, superior achievement in some colleges is hardly equal to inferior achievement in others. Correspondingly, a student will fail in one college, whereas in another a student with the same quality of work may be regarded as average.

The example of Miss C., who received very high marks in one school and only average grades in another, is a case in point. She received excellent marks in a college which she had attended for 3 years and in which she was regarded as one of the best students. Transferring to another for her senior year, no matter how hard she tried she failed to achieve more than an average mark. In the examinations, which were objective, so many scored higher than she that her position was always about average or below.

The emotional effects of her experience were extremely depressing. Accustomed previously to being a leading student, she now acquired the attitude of defeatism. She surmised, correctly perhaps, that she would be unable to do graduate work and consequently felt that a

barrier had been raised against her. The good school marks that she had received in a school where the standards were low misled her into believing that she was capable of succeeding in any school. The variation among schools in the true meaning of marks misleads many students.

Marks of one college represent a standard of accomplishment different from that of another, partly, no doubt, because of variation in marking standards but probably to a greater extent because of the differences in the quality of the students. In some colleges the poorest quarter of the students is as good as the best quarter in another. Thus, the better marks in the one institution really represent no more achievement than the poorer in another. Many who receive a diploma in one college would fail or, at best, do poorly in another. The dullest high-school graduates with adequate resources to pay their tuition and support themselves could discover some college where most of them would be able to obtain a college diploma. The quality of the student body in some colleges is so low that almost anyone can get passing marks.

Here, then, is a situation among individual teachers, departments, schools, and colleges where marks vary to such an extent that it is hard to tell what they mean. The teacher can scarcely be confident that the mark he records on a paper or report card is a valid rating of achievement. Unusual is the teacher who can say that his marks have definite meanings in terms of established standards.

What has been said about the variation in schools and colleges is true in a number of instances and should always be kept in mind, but in general among the great majority of schools a student's marks are a fairly reliable index to his abilities and what he will accomplish in any school. Usually the truly best students of any reputable school will do very well in any other school, and the poor or failing ones usually fail in another school, also. There are a number of students whose actual knowledge and abilities are above what their marks may indicate, and there are some pupils below their marks in actual knowledge and understanding. On the whole, however, the composite or average of a student's marks is a fairly good and in most instances a very good index to his abilities and what he will do in any future school situation. Considered from this broader point of view, marks can be depended upon.

Importance of School Marks. A study was made of college students to discover why they wanted to obtain good marks in their courses. Some of the reasons they gave were to earn a better chance for a job, to gain evidence of effective learning, to outstrip others, to please one's

family, and to uphold a reputation. There were other reasons, too, but practically all were in terms of personal gain and prestige. Marks are recognized by students as a means of helping them progress and enhancing their reputation.

Probably nothing else that a teacher does is regarded so seriously as the marks by which she evaluates lessons and those which she records on report cards. Many of her pupils work for and live by those marks; some are seriously depressed and discouraged by them; others, elated and stimulated; occasionally, children are indifferent to them. Even if their children do not do so, parents often take school marks seriously. They view the school and their children through the report card. Because most children and parents alike take the report card seriously, the marks recorded on it should be as true and reliable as it is possible to make them.

Marks are important also in that they determine failure and promotion in school. Surely, at times, teachers have failed some pupils who actually were better in achievement than others who were promoted. The teacher has an important responsibility when she determines who shall and who shall not pass.

School marks are used, moreover, to decide who shall receive honors and scholarships. Many schools have various honorary societies in which qualification for membership depends chiefly on high marks. In college, membership in Phi Beta Kappa and the privilege of wearing its coveted key is determined largely by marks obtained in college courses. In some colleges, students receive extra honor points for superior marks, and thus they are enabled to reduce the number of courses that they must take; they earn quality credits for excellent work. Valedictorians and salutatorians are those who have received the highest marks. Nearly all the honors and distinctions accorded students in school are given to those with high marks. Occasionally other factors, such as general all-round development, are taken into account, as they should be in conferring these honors, but the student's marks are usually given most consideration.

Some believe that no relationship exists between scholastic success and success in postschool life and that therefore school marks are without significance. They assert that those who were excellent students in school do no better during their adulthood than those whom teachers considered poor. Many editorial writers delight in pointing out in our newspapers the man who did not do well in school but is a notable success in life, especially in respect to accumulating wealth. Such editorials often lead us to conclude that the way to succeed in adulthood

is to fail in school during childhood, that to do exceptionally well as indicated by the teacher's marks is to ensure failure in postschool days.

As a matter of fact, those who succeed in school tend also to succeed in their vocations. In other words, a marked relationship exists between the quality of scholarship and the effectiveness of the adjustment that is made in later life. Marks thus help to predict who will make the best adjustment when school days are over, for they serve to discover those successful in school. The traits that make for success in school do tend to make for success in adult life, despite popular opinion to the contrary.

Moreover, school marks play an important part in recommendations for some positions. The student who is planning to teach will find it easier to obtain a position if his record contains good marks rather than poor ones. Large law corporations employ law graduates with the best scholastic records. When possible, hospitals select as interns those who have done best as medical students. Marks are thus held to indicate in a general way the amount or extent of certain desirable qualities.

Marks, then, to repeat, are exceedingly important. No doubt, some attach more importance to them than is warranted. Probably our educational methods would be improved if we minimized this emphasis by giving more general marks and thus recognizing the unreliability inherent in ratings of students by individual teachers. However, because even necessary changes are often made very slowly, it must be recognized that teachers will probably be giving marks for a long time to come. Consequently, it is well to have some principles in mind for guidance in methods of marking.

Important as marks are in that they represent fairly accurately abilities and industry, other personal qualities such as likableness, reliability, and cooperativeness must not be overlooked. A straight A student may not know how to make friends, for example. The teacher should be as concerned about the personality of her pupils as their marks—probably more so. It is not enough that a student gets good marks in the subjects he takes; he must try to achieve development of personal qualities as well.

A Symmetrical Distribution of Marks as a General Guide in Preventing Unwarranted Variation in Marking Standards. A few days before an instructor gave the final examination in his course, he told the class that he would allot the marks so that they would make a balanced distribution. Thus, he stated, 10 per cent would receive A, and 10 per cent would receive F; 20 per cent B, and 20 per cent D; and 40 per

cent would receive C. In other words, the distribution of marks was as follows:

Mark.....	A	B	C	D	F
Per cent.....	10	20	40	20	10

This distribution is a symmetrical one. Most of the grouping is around the average, and the extremes are balanced. The students, of course, were upset by this predetermined distribution of marks, for many of them visualized themselves as being included in the 30 per cent who were destined to receive D's and F's.

The general theory, or principle, underlying the symmetrical distribution of marks is the assumption that the achievement of students is distributed in this manner. Consistent with this assumption, the marks representing the quality of achievement should be distributed symmetrically also. Consequently, the number of A's and F's are equal, a large number of the B's are equal to the D's, and the C's are the largest in number.

Psychologists, educators, and students, too, have opposed for a number of reasons the general and indiscriminate application of the normal, or symmetrical, curve. It may be objected that the average of each and every class is not C and that a fixed percentage should receive C's, with a fixed but smaller percentage receiving B's and D's and with a fixed but smallest percentage receiving A's and F's. Possibly, on the average, such a principle is correct, but classes vary in the quality of the students attracted to them, and no blanket scale is suitable. Selective forces operate to bring superior students into some classes and inferior students into others.

Then, too, the instruction is better in some classes than in others. Some particularly able teachers are so effective that their students achieve more than do the pupils of others. In such instances, more of the better marks should be given to the members of those classes which achieve more than to those whose achievement reflects poorer instruction.

Another point pertains to marking the students of various ability levels in terms of those ability levels or according to the same standards or an absolute one. If the same standard is maintained for all students, then the dull are competing with the bright and can rarely, if ever, achieve the higher marks. If marked according to the standards of their own ability, the weaker students will receive the usual proportions of the various marks, as will the average and brighter students also. Then the marks of each ability level will not mean the same; A's

earned by the dull will not represent the standard of achievement that such a mark represents for the bright; and correspondingly for the other marks. In using the marks for guidance purposes, teachers and administrators will need to interpret them in terms of ability levels.

Those who make the point that the normal curve should not be applied without taking several factors into consideration are on solid ground. If the principle of the normal curve is applied to all classes indiscriminately, the distribution of marks of every instructor will be the same but the marks will not have the same meaning. As has been said, classes vary tremendously in their capacity for achievement and also in the quality of instruction that they have received. If every instructor gives the same proportion of A's, B's, C's, etc., then an A of one instructor will not represent a degree of achievement corresponding to the A of another, and similarly with the other marks, for a very superior class will get the same distribution of marks as a very poor class.

The strict application of the principle of the normal curve to the marks of a given department may result, therefore, in an injustice to the students. Reference has been made in this chapter (page 489) to an art department of a certain university in which about 45 per cent of the students got A's. To particularize further, in this department about 90 per cent received A's and B's. When the dean noticed the unusually large proportion of high marks in this one department, he was disturbed and asked for an explanation. The head of the department pointed out that the number of students taking art courses is relatively small and includes mainly those who are interested and have special talent in art. In other words, the art students are a selected group for art ability. Furthermore, because 12 per cent drop out before finishing, the poorest are eliminated and only the best remain and are marked. This is not the case in the mathematics and English departments, for instance, where students of all degrees of aptitude are found.

Possibly the department chairman stressed the selective character of his students a little too much, but one can be certain that he was right in principle. If a teacher gives better marks, as the art teachers did in this instance, because he feels that he has a superior class, he should have definite evidence that his students are superior. He should know, from their marks in other courses, from mental-test results, and from their special aptitudes whether they are a superior, average, or inferior group. Often one's personal judgment of a class is not substantiated by the objective results.

A Standard Distribution of Marks as a General Guide. The teachers of a school may decide that they should be guided in general by a

standard distribution of marks. The following are sample distributions showing the percentage of each mark; any one of these might be adopted, or any other standard devised:

	A	B	C	D	F
1	10	20	40	20	10
2	7	24	38	24	7
3	5	25	40	25	5
4	5	20	50	20	5
5	15	25	45	10	5
6	10	20	50	10	10
7	15	25	45	15	0

All these distributions are symmetrical except numbers 5, 6, and 7. Distribution 2 is sometimes regarded as being the normal distribution when five divisions, or steps, are used. The steps need not always be represented by letters but may include numerical ranges or the percentage system, such as 95 to 100, 85 to 94, 70 to 84, 0 to 69, or whatever numerical steps one may wish to choose. If a school decides, however, that it will fail no one or very few or will have a preponderance of passing grades, it can adopt scheme 7 or one similar to it.

A standard can be serviceable if it is usually observed by the teachers of a school system but disregarded when there is a good reason for doing so, as when a class is definitely superior or inferior. The usefulness and validity of a standard for marking can be illustrated by describing briefly how the superintendent of one school applied a standard. In this school the children in the third grade received marks so much lower than those which they had got in the second grade that the parents were aroused. They criticized the third-grade teacher so severely that it became necessary to go into the matter.

In order to understand the difficulty, the superintendent studied the marking systems of his teachers. He discovered that the second-grade teacher gave much better marks to the pupils than either the third-grade teacher or the other teachers. It was suggested that they all adopt a common distribution for marking members of the classes in the various subjects. Copies of the distribution of grades given by each teacher were mimeographed so that they could be compared by the teachers. The second-grade teacher soon distributed her marks in harmony with those of the other teachers and thus corrected the difficulty arising from the large differences in the marks obtained by the pupils in her grade and the grade following. It is a good practice to mimeo-

graph the distribution of marks of all the teachers and give each teacher a copy of the results. The individual teacher can compare her marks with others, and the correction of unusual or unwarranted methods will result.

A school can determine for itself what standard it wishes to observe. The faculty in a high school may say that it will observe any one of the schemes listed on page 495. If, for example, it adopted scheme 1 as the standard for freshmen, then the instructors would aim to distribute their marks so that, of all the freshmen in all their subjects, 10 per cent would receive A's and 10 per cent F's, 20 per cent B's and 20 per cent D's, with the remaining 40 per cent C's. It is doubtful that a high school should maintain the same standards for the sophomore, junior, and senior years. It might do so on the decision of the faculty, but it is logical to decrease the proportion of low marks from the freshman to the senior year and increase the number of higher marks correspondingly, for after the first year the students are a more or less selected group. In the senior year the percentage of failures should be smallest, for by then many of the weakest students have dropped out.

The experience of a geography teacher illustrates how marks might have been assigned in a balanced manner. She had three sections of students, and these were given the same assignments, taught similarly, and given the same examinations. When the examinations had been scored and the average for each class calculated, she found that the classes differed in their achievement. She was perplexed as to what proportion of the various marks to give the members of each class and decided to apply the same distribution of marks to each section. By this method there was the same proportion of A's in the poor as in the good section and the same percentage of F's in the best as in the poorest section. Obviously, here was a faulty use of the principle of normal distribution. According to the method used, the achievement that resulted in a C in the best section resulted in a B and possibly an A in the poorest section. Such inequalities in the marking standards are an injustice to the students.

It would have been sound practice to combine the scores and make one distribution for all three sections. Then those in any class who received A did so because their achievement was equal to the A work in either of the other groups. Similarly, the A, B, C, D, and F of one section would have represented the same quality of achievement as these marks obtained by the students of any other section.

The problem of grading students and their work is one of the most troublesome but important that the teacher faces. She should consider

it with great care and be sure that she has good reason for what she does. However, a teacher is hardly warranted in having much confidence that the marks that she puts on a lesson or records on the report card are wholly accurate or reliable, for observation and experience have revealed, as stated before, that evaluations of student work differ from teacher to teacher, from department to department, and from school to school. Frequently, the evaluations of even a single teacher will be inconsistent.

Ideally, the mark given in any subject should indicate the degree of achievement or attainment in that subject and nothing else. Other qualities of the students should be marked separately. Teachers, at least within the same school, should attempt to define the basis for their marks so that the mark of one teacher will have the same meaning as that of another. The individual teacher should use a system such that her marks on one day are comparable with those given on another. Applying a standard, such as the normal distribution or some other arbitrary standard, may prove helpful in attaining accuracy; but when it is used, certain factors must be taken into account, especially the quality of the students. The school mark should be made mainly, as far as possible, a reliable indication of the quality of achievement.

MODIFICATION OF THE PREVAILING MARKING SYSTEM

Undesirable Effects of the Traditional Marking System. Marks have been discussed to a considerable extent because of their great importance in most schools. The discussion, however, should not keep us from considering the advisability of minimizing the emphasis that we place on them. Excellent arguments can be offered for modifying or possibly altogether abandoning the conventional marking systems. Some of the evidence, such as the variation of standards and the unreliability in marks, has already been set forth. Such facts are important, but the effect of marks on the learning process is even more important.

Marks affect the learning process in education by becoming, for the large proportion of students, the end in education. Those accustomed to D's want C's; the C students want B's; all hope for A's, and a few expect them. Most students discuss the grades that they receive in a course and not the facts and principles included in it. They react emotionally to the grade on a lesson or paper but are, for the most part, indifferent to the content of the lesson itself. Students from kindergarten through the graduate school become primarily seekers for marks and true learners only secondarily, if at all.

Many students are relatively indifferent to the quality of instruction if, in the end, they receive a satisfactory mark. One student said of his teacher, "He is no good as an instructor; but if I get at least a B, I'll be satisfied." Many students evaluate their subjects or courses in terms of the marks that they receive in them. Thus, marks make students comparatively uninterested in learning and education.

The extent to which school marks influence and control the mental life of school children can be illustrated by the case of Esther, a little girl who had spent 2 years in school, 1 in the kindergarten and 1 in the first grade. In the kindergarten, no marks were given. Esther did her work well and showed considerable initiative. She had much freedom and exhibited a lively interest and curiosity. She asked many questions and seemed to be greatly interested. Her attitude changed in the first grade, for there she was marked on almost every bit of work that she did. She would receive a gold star for this, a silver star for that, and a rubber-stamp star for a mediocre lesson. It was not long before she began to work for the different grades of stars. Becoming a victim of the narrow control that the teacher exercised over her by incessant grading, Esther lost much of the natural curiosity and initiative that had formerly characterized her work. She became a task doer, a lesson getter, because she was trained to ascribe a high value to the marks that the teacher put on the lesson.

Furthermore, the system that involves the continuous rating of the pupil's work by the teacher results in a relationship between teacher and pupil that is not conducive to the best learning situation. The student does tasks for the teacher, who in turn rates or marks how well she thinks these tasks have been performed. The student asks, "How do you want it done?" or "How long does this paper have to be?" He becomes a performer of set specified tasks for which he wants a good rating. Need we wonder that students fail to do any independent work, that they cease reading and studying as soon as a course or subject has been completed? For most students, with the final grade in a course comes the termination of all effort and interest to learn anything more about the subject.

The relationship of teacher and pupil is further complicated by the fact that marks, instead of being an incentive to learning, become an end in themselves. Instead of a cooperative partnership in which pupils and teachers become interested in their mutual growth and development, the situation becomes one in which the teacher holds the power of marking as a control over the pupil. Some teachers use this power vindictively and give high marks to those whom they like and

lower ones to those who are in disfavor. The learning situation would be much better for both pupils and teacher if each minimized marks and worked together on the problems that developed for them in and out of the schoolroom.

Abandoning the great emphasis that is put on school marks would not destroy any desirable incentives. It is true that children need to be stimulated in their learning, but this motivation can be otherwise provided, as we have indicated elsewhere (page 322*ff.*). Here, however, the point to bear in mind is that emphasis on school marks militates against the effectiveness of true and desirable incentives.

The present school plan divides the education of any given individual into numerous subjects; during these periods of study, many marks are given; at the end, final marks are recorded. Such a procedure is not sound pedagogy. Education becomes divided into sections artificially kept apart, whereas psychologically they belong together. Furthermore, thousands of records are kept of student marks. At the end of every month or 6 weeks, at the end of every quarter, semester, or term, millions of grades are reported and recorded in the American school system. They are unnecessary. The process is expensive and wasteful in terms of energy and money and doubly wasteful because the multiplicity of marks is educationally unsound. Fewer marks on larger units of work would be much better. Some think that, if we did one-tenth as much marking as we do now, we could mark more effectively.

Modified Marking Systems. Instead of abandoning the conventional marking systems altogether, it would be more practical to modify them. At present, we need to make some report to the pupil and his parents of his responses to school experiences.

In the lower grades, a simple report three or four times a year is adequate. This may consist of a written paragraph describing the child's interests and habits, his special strength and weaknesses, and the general adjustment that he is making in school. The parents should be invited to cooperate with the teacher in effecting the best possible development of the child. No specific ratings are necessary. A simple, direct statement of the child's general progress or lack of it is best.

The following is an example of a teacher's written statement about a pupil in the second grade:

Blanche shows good interest in all the school activities except number work. I doubt that we should make much point of this lack of interest, as it may develop when she gets older. We are trying to develop it indirectly, but we cannot force it. Of much more importance is the fact that Blanche has many friends and gets along very well socially.

If a more formal card is wanted—one that contains actual ratings—one can be used that rates the children for their work habits, social habits, and growth. A simple, clear statement should be made about each trait, which can then be marked S, satisfactory; U, unsatisfactory; and I, improvement. Space should be left for a supplementary statement by the teacher if she wishes to make one and for a statement by the parent, too. The following is an example:

REPORT CARD SUITABLE FOR LOWER GRADES

	Fall	Winter	Spring
<i>Work habits:</i> Shows interest and works diligently....	S	S	S
<i>Social habits:</i> Gets along with himself and others....	U	I	I
<i>Growth:</i> Expanding in his interest and acquiring new ideas and abilities.....	S	S	S

ATTENDANCE RECORD

	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
Days absent....										
Times tardy....										

Fall rating:

Teacher's comment: John has shown some temper tantrums and has been unwilling to participate in some of the group projects.

Parent's comment: When he has a tantrum, don't pay any attention to him. Don't urge him to take part in the activities. Possibly if he is neglected, he'll wish to join.

Winter rating:

Teacher's comment: John is improving. Your suggestions were good ones.

Parent's comment: He seems to like school better, for he doesn't complain about going.

Spring rating:

Teacher's comment: Altogether, John has had a good year and is now ready for the next grade.

In the grades in which accomplishment in specific subjects is to be rated, the subjects can be marked with the same symbols: S to indicate satisfactory work, U to indicate unsatisfactory achievement, and I to indicate that the work is not marked U because there are hopeful evidences of improvement. There should also be space for teacher's and parent's comments and for marking qualities similar to those named on the cards for the lower grades, as has been illustrated.

It is unnecessary and wasteful of time and energy to mark the

pupils on their achievement and send home a report card more than three times a year. Furthermore, parents do not need a report every 4 or 6 weeks. They know approximately what their children will do on the basis of what they did the previous year. If reports are made only half as frequently as at present, parents will be sufficiently informed. When necessary, the teacher can send home a special report indicating an unfavorable change in a child's scholarship. Then parent and teacher can cooperate in order to find the cause of the change and attempt to find methods for bringing the child's achievement back to its usual level.

Some schools may favor three descriptive categories of pupils' responses in school, using H, S, and U. The letter H represents honors, or work of A grade; S, or satisfactory, represents B, C, and possibly a D grade of work; U represents unsatisfactory work or F, and in some instances D work.

In addition, the report card should be made a means for stimulating the child's development. It can be more than a report; it should be one of many educational methods that contribute to the total education of school children. To be sure, even when report cards are greatly simplified and are issued much less frequently, the teacher's errors in judgment are not entirely removed. Because fine gradings are not attempted, however, unreliability is minimized, and the marking system aids in stimulating the educational growth of the child and in guiding him, rather than merely indicating his classroom achievement.

The reader may ask, "If we are to minimize the report card, how shall we know how the pupils stand in the subjects they are taking? How shall we measure and record their achievement?"

These questions are very easy to answer. Today we have excellently constructed achievement examinations for every subject. By the use of these published tests, say once a year or even every other year, the standing of each child in his various subjects can be determined. The tests are standardized so that the child is evaluated according to state- or nation-wide standards, and each child of a grade can be compared with every other child and ranked accordingly. By using standardized achievement tests from the first grade through college a very satisfactory evaluation can be made of the achievement of students. In the previous chapter the measurement of achievement by the use of examinations was discussed in considerable detail.

Report Cards Serving the Pupil. Let it be emphasized again that the purpose of the report card is to bring about improvement in the growth and development of the pupil. It is to be a means for encour-

aging the pupil, parents, and teacher to cooperate in helping the pupil make the greatest progress possible in his efforts at all-round improvement. Consequently, the report card should include evaluation and diagnoses of the pupils' degree of success not only in his school subjects but also in behavior or living.

The mark given for arithmetic, geography, or any other subject should represent as exactly as possible the actual achievement in or knowledge of that subject. Other qualities such as study habits should be marked or evaluated separately. Thus in some cases a pupil may be marked low in achievement but high in industry, or vice versa.

Some schools give a mark for various social, personal, and educational qualities. Some of these are friendliness, happiness, courteousness, obedience, neatness, promptness, industriousness, effort, participation, creativeness, initiative, and the care given school property. These terms cover fairly well the behavior and activity of children in school.

Some previous chapters were devoted to the mental hygiene, behavior, and adjustment of both pupils and teacher. The symptoms of maladjustment and unhappy behavior were pointed out. Happy, effective behavior was also described. In evaluating the pupil's progress and adjustment the teacher will find it profitable to think in terms of mental hygiene and wholesome behavior.

In reporting to parents by means of written notes and letters the teacher should have the mental-health and personal-adjustment point of view. In conferences with the parent—and conferences should be invited and encouraged—the teacher and parent should discuss the pupil in terms of his personal and social development as well as of achievement in his subjects. Conferences with the pupil will also be most profitable if conducted on this basis.

Report-card time in many schools has been a time of apprehension not only for pupils but also for teachers, principals, and parents. However, if reports are made on the individual pupil when they will help him either achieve better or live more effectively, apprehension will be supplanted by an attitude of appreciation. The best purpose of the report card and supplementary reports is to evaluate and diagnose the pupil so that he can improve his living. When this purpose is served, the report card will be an integral part of the educational process.

SUMMARY AND REVIEW

Students are interested in knowing what factors are taken into consideration when the teacher assigns their marks. Sometimes students suspect that personal factors affect marks.

Sometimes teachers take into account promptness, effort, attitude, and what is called good citizenship when they determine a child's mark in reading, arithmetic, or other subjects.

A mark in a subject should be determined by knowledge or achievement. Other qualities should be ruled out or marked separately.

There are no uniform standards for marking. A given piece or quality of work is given a wide range of marks. Teachers differ in their standards, there are different standards in various departments of high schools and colleges, and standards vary greatly from school to school. There are schools with much poorer students than other schools, but a poorer school may give even higher marks.

School marks are important to the prestige of the pupil and his family. Marks are also important in obtaining a position and being recommended for college. Many prizes and honors are based on the marks pupils have received.

Using a symmetrical, or "normal," distribution as a guide for assigning marks may tend to bring about fair standards, but special consideration must be given to a fair standard of distribution and to the quality of the class or grade.

Some psychologists and educators feel that the present marking system is not conducive to good learning and scholarship in that it causes students to work for marks and limits their methods of studying. Consequently, it is believed that the present marking system should be modified so that the emphasis will be, not on grading students, but on diagnosing them and giving them the help they need. It is recommended that the teacher and parents confer with each other about the welfare of a pupil whenever it will be helpful to do so.

Test Your Thinking

1. A mark in a subject or course should represent achievement in that subject and not various personal qualities. Comment.
2. An A of one teacher means the same as the A of another, and similarly for B's, C's, and other marks. Comment on this statement.
3. Describe how departments within the same college differ considerably in their standards of marking.
4. It is possible for a student to do the same quality of work in two colleges and get an A in one and only a C in another. Explain.
5. Even though it is true that there are many instances of the unreliability of individual marks, marks as a whole are fairly reliable indicators of very important qualities and abilities of students. Explain.
6. A representative of a large firm who hired many graduates of engineering colleges said, "Give me my choice of the graduates who in scholarship are

in the upper 20 per cent, and you can have the rest." What is your reaction to this statement?

7. Describe how a standard distribution of marks can be used either wisely or unwisely in a school.
8. What do you think would be a desirable distribution of marks for the freshmen of a large high school?
9. What are the advantages and disadvantages of the traditional marking system?
10. What type of marking or reporting system do you think is most conducive to the growth and development of pupils?

References

- AMES, V.: Factors Related to High-school Achievement, *Journal of Educational Psychology*, **34**: 229-236, 1943.
- BAKER, H. V.: Reporting Pupil Progress to Parents, *National Elementary Principal*, **23**: 32-34, 1944.
- BIXBY, P. W.: Parents and Teachers Study Report Cards, *National Elementary Principal*, **25**: 90-92, 1945.
- BOLMEIR, E. C.: Analytical Appraisal Report of Pupil Progress, *School Review*, **51**: 292-299, 1943.
- COHLER, MILTON J.: Scholastic Status of Achievers and Non-achievers of Superior Intelligence, *Journal of Educational Psychology*, **32**: 603-614, 1941.
- CUMMINGS, R. L.: New Report Cards, *Grade Teacher*, **64**: 94, 1946.
- ENGLE, T. L.: A Comparative Study of First and Final Marks, *School Review*, **40**: 61-66, 1932.
- ERICKSEN, STANFORD C.: An Experimental Study of Individual Differences in Scholastic Motives, *Journal of Educational Psychology*, **31**: 507-516, 1940.
- GERBERICH, J. R.: Factors Related to the College Achievement of High-aptitude Students Who Fail of Expectation and Low-aptitude Students Who Exceed Expectation, *Journal of Educational Psychology*, **32**: 253-265, 1941.
- HIMSL, M. A.: Wanted: Report Cards Parents Can Understand, *Nation's Schools*, **33**: 23, 1944.
- HOOD, C. E.: Reporting on the Whole Child, *Nation's Schools*, **39**: 23-25, 1947.
- JOHNSON, C. S.: Parents Help Plan Report Cards, *Nation's Schools*, **38**: 45-46, 1946.
- JOHNSON, V. L.: What a Report Card Can Tell You, *Parents' Magazine*, **20**: 26, 1945.
- KVARACEUS, W. C.: The Primary Report Card, *Elementary School Journal*, **39**: 747-750, 1939.
- LINDEL, A. L., and A. MOHR: New Report Card, *National Elementary Principal*, **25**: 39-41, 1945.
- LITTLE, R. C.: Whither Grading, *National Education Association Journal*, **36**: 12-13, 1947.
- LUCAS, W. C.: Appraisal Cards More Helpful than Report Cards, *Nation's Schools*, **34**: 31-32, 1944.

- MILLER, E. F.: Report Card Goes Home, *American Childhood*, 32: 7-8, 1947.
- MILLER, J. M., and R. J. MAASKE: Report Card Can Interpret School Objectives, *National Elementary Principal*, 25: 127-132, 1945.
- MOORE, CLARENCE C.: The Elementary School Mark, *Journal of Genetic Psychology*, 54: 285-294, 1939.
- RISEN, MAURICE L.: Relation of Lack of One or Both Parents to School Progress, *Elementary School Journal*, 39: 528-531, 1939.
- ROSS, C. A.: Report Card Designed to Enlist the Parents' Cooperation in Rating and Guiding the Child, *American School Board Journal*, 107: 28, 1943.
- SEARS, PAULINE SNEDDEN: Levels of Aspirations in Academically Successful and Unsuccessful Children, *Journal of Abnormal and Social Psychology*, 35: 498-536, 1940.
- WALTERS, H. G.: Let's Diagnose Jimmy not Mark Him, *School Executive*, 66: 39, 1947.

APPENDIX

DISCUSSION OF SOME STATISTICAL AND EXPERIMENTAL CONCEPTS THAT ARE CONTAINED IN THIS VOLUME¹

CORRELATION

One of the most common and probably one of the most important concepts in psychology and education is that of correlation. It appears many times in this volume, and it is highly desirable that the reader have more than the ability to recite a few words about it. Rather, he should have a true comprehension of it.

A synonym for correlation is *relationship*. In statistics, correlation pertains to the relationships between traits, scores, values, and other quantities. In the text, the relationship or correlation of school marks, of the characteristics of identical twins, and of many other values is given, and the amount of the correlation is indicated by a decimal fraction usually expressed in hundredths.

Nature of Correlation. First let us consider the nature of correlation by using columns of values. When thinking of correlation, think of pairs of scores or values arranged in vertical columns. Each pair represents the scores or attributes of a person or thing. Examine the relationship between the values in Table A. The pairs of values are designated by Roman numerals. Note how the values are related. Observe pair I, with the values 24 and 60, the largest in each column; thus, the highest value is related or associated with the highest. Note also that in pair II, the next to the highest is related to the next to the highest; in pair III, the third from the highest in the column of X values is accompanied by the third from the highest in the Y column; and so on down to the value 2, the smallest X value, accompanied by 5, the smallest Y value. These relationships make up a perfect positive correlation which is designated by the coefficient of correlation 1.00. The correlation is said to be plus one.²

TABLE A

	X	Y
I	24	60
II	22	55
III	20	50
IV	18	45
V	16	40
VI	14	35
VII	12	30
VIII	10	25
IX	8	20
X	6	15
XI	4	10
XII	2	5

¹ For a fuller treatment of the topics discussed here as well as of other statistical topics, see the author's text *Statistics for Students of Psychology and Education* (McGraw-Hill) or any other standard text.

² When correlations are positive, the sign is usually omitted.

In Table B, the relationship of the pairs of values has been changed. Now the X and Y values are associated systematically in reverse order—the highest with the lowest; the next to the highest with the next to the lowest; and on down to the last pair, number XII, in which the lowest is associated with the highest.

TABLE B

	X	Y
I	24	5
II	22	10
III	20	15
IV	18	20
V	16	25
VI	14	30
VII	12	35
VIII	10	40
IX	8	45
X	6	50
XI	4	55
XII	2	60

This relationship is called a *perfect negative correlation*, and it is designated by the coefficient of correlation -1.00. The correlation is said to be a negative one.

The order of the 12 pairs of values will be changed again, as shown in Table C. In this instance, no consistent relationship, either positive or negative, exists between them. The high, average, and low values are associated in a hit-or-miss fashion, so to speak. The correlation of the values as arranged in Table C is called a *zero correlation* and is expressed by the coefficient 0.00.

Extent of Correlation. Correlations range in magnitude from zero to either plus or minus one and are usually expressed in hundredths although sometimes in thousandths.

In the text, various coefficients were given, some very high, as those in the .90's; others moderate, as those in the .40's and .50's. Low correlations are in the .10's and .20's. The examples given on these pages illustrate correlations of plus and minus one and of zero, or no correlation. There are intermediate amounts of correlation, in which the extent of relationship varies between the extremes illustrated. When the trend is greater, the coefficient expressing the relationship approaches plus or minus one; and when the relationships are least, the coefficients approach zero.

The nature of the correlation is indicated by whether it is positive or negative. If the trend in the magnitude of the values is inverse, then the correlation is negative; and if it is direct, then the correlation is positive. The nature of the correlation, whether positive or negative, does not determine the extent of relationship, which is indicated by the coefficient.

Thus, a coefficient of correlation of -.50 indicates the same extent of relationship as does a correlation of + .50. The difference is in the nature of the relationship, as indicated by the Tables A and B and their accompanying discussions.

Coefficients of correlation range from zero to plus or minus one, as has been indicated; and questions may be raised as to the extent of relationship according to coefficients .10, .20, .30, .40, etc. The answer to this question is very complicated and will be treated only in a general and superficial

TABLE C

	X	Y
I	24	10
II	8	50
III	14	60
IV	2	20
V	6	30
VI	12	40
VII	20	25
VIII	22	55
IX	4	35
X	18	45
XI	16	5
XII	10	15

way. It is probably sufficient to say that the extent of correlation does not follow closely its numerical size. For example, a correlation of .80, roughly speaking, is considerably more than twice the correlation of .40; and similarly with other correlations. In somewhat the same fashion, the difference between correlations of .90 and .80 is much greater than the difference between .20 and .30, for example. In other words, differences in correlation nearer plus or minus one are much larger than similar numerical differences in the coefficients nearer zero. The differences are least important near zero and increase in importance with the size of the coefficient, being greatest near plus or minus 1.00 in the manner that has been indicated.

A direct consideration of some of the coefficients reported in the text will help to explain the size and meaning of coefficients of correlation. Table 6 (page 268) contains correlations that range from .371 to .981. None of the correlations is negative. The correlation of .981 between the standing height of the pairs of identical twins indicates that their heights correspond almost perfectly. There were two measurements in this case for each pair of twins, which consisted of the height for each twin in a pair. If the twins had had exactly the same height, the correlation would have been 1.00; but because the coefficient is close to 1.00, it is apparent that the height of the members of each pair was almost the same.

In the case of a correlation of .371, it is apparent that the scores on the Woodworth Mathews test of mental health for the members of each pair did not correspond very closely. Even though there was a trend in the similarity of the scores, there was considerable disagreement.

In the case of coefficients in the .70's and .80's, considerable similarity exists in the scores and measurements; and for coefficients in the .90's, the correspondence is really high.

Correlation, then, refers to the relationship or correspondence of scores, values, or variables. The nature of the relationship is indicated by the terms *positive* and *negative*. The extent of correlation, in turn, is indicated by the size of the coefficient of correlation.

HETEROGENEITY AND HOMOGENEITY—MEASURES OF VARIABILITY

Statistically, the concepts of heterogeneity and homogeneity are quantitatively explained by measures of variability. The variation of groups is described by determining, for example, the range and standard deviation of a group. Other measures of variability are used, but it will suffice to describe these two briefly.

The range is the distance from the highest to the lowest. The range in the age of the pupils of a given class, for example, is found by subtracting the age of the youngest from the age of the oldest. If the youngest child in a sixth grade, for instance, is ten years three months and the oldest is sixteen years six months, the range in age is 6 years 3 months. The range in I.Q.,

M.A., A.A., height, weight, and other values is found in the same way. The range gives the teacher the distance between the extremes of a group for any characteristic and thus gives a general index to the heterogeneity or homogeneity of a group.

The standard deviation is a more valuable measure of variability than the range, being determined in a statistically sound manner by taking every score or value of a group into account. In a normal or fairly normal or symmetrical distribution, the standard deviation is the distance above and below the mean that includes about two-thirds of the scores or values.

In groups having approximately the same averages, the size of the standard deviation indicates the variability of the groups. Because the amount of variation in groups is so important educationally, a knowledge of the variability of groups, or classes, in a school might result in action for better adjustment of pupils to school situations as well as for changing the situations for the pupils.

MEASURES OF CENTRAL TENDENCY

These have been mentioned and discussed either directly or indirectly to a sufficient extent. If a fuller knowledge and understanding of the averages or measures of central tendency as well as of other statistical measures are needed or desired, a text in statistics should be consulted.

EXPERIMENTAL AND CONTROL GROUPS

In the course of experimentation, scientists have found it necessary to test their theories and hypotheses by arranging their experiments so as to make use of experimental and control groups. The need for having a "control" was strikingly demonstrated in William James's uncontrolled experiment in which he first memorized 158 lines of Hugo's *Satyr* in 131 minutes, then "practiced" his memory 20 minutes a day for 38 days on *Paradise Lost*, and then found that it took him 151½ minutes to memorize 158 other lines from Hugo's *Satyr*. He concluded that because it took him longer to memorize the second 158 lines, his mind had not improved. This experiment lacked a "control." According to good experimental procedure for a situation such as this one, it is necessary to have a single variable, which in this instance would have been the practice on *Paradise Lost*. It is possible that the second 158 lines of Hugo's *Satyr* were more difficult and therefore required more time to memorize, even though practice on *Paradise Lost* had increased efficiency. The experiment, in order to be valid, should have had an experimental and control group, as indicated by the following hypothetical example:

It is highly desirable that the initial abilities of the two groups be equal or very nearly so, which is true in this example. The experimental group is given special practice, the value of which is being tested. In this instance, the plan of the experiment is to test the value of practice in memorizing

	Experimental group (30 high-school juniors)	Control group (30 high-school juniors)
Initial test (memorizing 158 lines from <i>Satyr</i>).....		
Practice.....	181 Memorizing <i>Paradise Lost</i> 20 minutes each day for 38 days	180.5 No practice in memorizing
Final test (memorizing 158 other lines from <i>Satyr</i>)....	178	180

Paradise Lost on the ability to memorize lines from the *Satyr*. The control group had not had any practice in memorizing, and it is assumed that the experiences that might affect the results are the same for both groups except for the special practice of the experimental group. This, being the only difference, is known as the *single variable*; and if there is any difference in the results, it can be attributed to this one difference in their experience.

According to this hypothetical arrangement, the score (number of minutes) of the experimental group is slightly better than the control, thus hypothetically indicating that probably a little advantage accrues from the practice on *Paradise Lost*. The difference, however, should be tested statistically to see if it is large enough to be statistically significant.

The outline given here is simple. For instance, other experimental groups could memorize nonsense syllables, mathematical formulas, Latin words, or any other material. It is necessary, however, to have a control group not experiencing the activities that are the variables whose effects are being tested.

SIGNIFICANCE OF THE DIFFERENCE

This term is frequently used in psychology and education, and its general meaning should be set forth. Its fuller meaning will have to be obtained by special study and instruction. When the difference between the averages of two groups is found, the question is asked: Is the difference large enough to be significant? In other words, it may be asked whether or not similar differences will be found if corresponding groups are compared under similar conditions a great number of times. If, with repetition, a difference was found between groups, and the same group was superior each time, then we may be sure that the difference is a true and significant one.

Obviously, it is impossible to repeat an experiment a large enough number of times to discover whether one group or the groups of the same characteristics are always superior and thus to determine that the difference first obtained is a true one. For example, if one is testing the effectiveness of a method of teaching reading by comparing it with other methods through actually trying the various methods on groups of pupils of similar initial ability and capacity, it would be impossible to repeat the experiment indefinitely

to see if the differences obtained are consistent and thereby real ones. Instead, statistical procedures are applied to the averages of the groups to determine whether the differences are true ones or are due to chance or to factors incident to a poorly managed and controlled experiment. The results of the statistical analysis also indicate the extent to which the differences are real ones and thus indicate the certainty with which we can conclude that a difference will occur under similar circumstances.

In other words, the largeness of the difference is tested. Thus, when it is said that the difference between two groups, as determined by comparing their averages, is significant, it means that the difference has been tested and found to be a real one and not one due to chance or accidental and extraneous factors. Then reliance can be placed on the value of the method, influence, or factor being tested.

GLOSSARY¹

- Aberration, mental.** Deviation from the average, or normal, in mode of thinking and behaving to a degree sufficient to be considered a disorder.
- Ability.** Refers to what a person actually can do. Actual performance.
- Acceleration.** Extra promotion or faster than usual school progress.
- Achievement quotient.** Same as accomplishment quotient. It is obtained by dividing subject matter or achievement age by mental age.
- Accomplishment quotient.** Obtained by dividing the achievement age by the mental age. Achievement age is determined for any given subject by means of standardized tests in that subject; and mental age by means of an intelligence, or mental, test.
- Adolescence.** The period between childhood and maturity; it approximates the teens.
- Adrenals.** Ductless glands adjacent to the kidneys. The adrenals give off a chemical known as adrenin, which releases a sugar supply from the liver for energy purposes.
- Adrenin.** The chemical or hormone given off by the adrenals. Adrenin functions to increase energy output.
- Age, chronological (C.A.).** The number of years, months, and days that one has lived.
- Age, mental (M.A.).** Mental level according to the average scores of any given age as determined by mental, or intelligence, tests.
- Age, subject-matter.** Educational age, level of achievement in standardized, subject-matter test according to the average scores of any given age. Arithmetic, history, reading, geography, and other subject-matter ages are determined by the average obtained by pupils of any given age on a standardized test for each subject.
- Alpha hypothesis of learning.** One of Dunlap's principles of learning: A response to stimulus increases the likelihood of that response's resulting from the same stimulus.
- Altitude.** When applied to mental ability or intellect, altitude is determined by the difficulty of the tasks a person can do.
- Analogy.** In psychology, the relationship of pairs of attributes or qualities as found in mental, or intelligence, tests.
- Antisocial.** Refers to behavior that is not for the good of society.
- Aptitude.** Potentaility, capacity.
- Associate learning.** The acquisition of facts, principles, ideas, or materials that are related to or are an outgrowth of primary learning.

¹ These definitions and descriptions apply especially to psychology and education.

Associated response. A response to a different stimulus from the one that ordinarily produces the response because the stimulus was paired with the usual stimulus.

Attention. The directing of one's energies and efforts toward stimuli. An awareness of stimuli.

Beta hypothesis of learning. One of Dunlap's principles of learning: The response to a stimulus lessens the probability of that response to the same stimulus.

Bond theory. The theory that there is a specific neural connection between stimulus and response.

Caffeine. An alkaloid that has a stimulating effect and is usually associated with coffee and tea.

Capacity. Aptitude, potentiality. A person's capacities are indicated by his abilities or what he can actually do when he has had optimum practice.

Compensation. Behavior that has for its purpose the making up for or the covering over of weakness and deficiency. Frequently, the compensating behavior is undesirable.

Complex. An emotionally colored idea. Hate, bias, prejudice, and jealousy are complexes.

Concave learning curve. The curve or portion of a curve that is concave because it represents increasing rate of learning.

Concomitant learning. The acquisition and development of attitudes, ideals, and appreciations that result from primary and associate learning.

Conditioned response. A response evoked by the second of two stimuli which though originally not effective has been made so by its simultaneous occurrence with the original stimulus.

Configuration. The pattern, form, or structure of stimuli resulting from their relationships or arrangement.

Conflict. The clash or struggle of conflicting ideas, ideals, and tendencies of behavior.

Congenital. Acquired or influenced during the period of gestation, or in the uterus.

Control group. The group that is matched with the experimental group but is not subjected to the special experimental conditions of the experimental group.

Convex learning curve. A curve or portion of a curve in which the rate of learning is decreasing.

Correlation. The relationship between traits, qualities, or measurements. The coefficient of correlation is a numerical amount ranging from - 1.00 to + 1.00 that indicates the nature of the relationship or correspondence and also its extent.

Cramming. Hurried and concentrated attempts to learn a great deal in a short time in order to satisfy certain requirements.

Cretin. An infant or child who is suffering from a deficiency of the secretion given off by the thyroid gland. A cretin's physical development is not normal, and he is mentally deficient.

Critical ratio. A statistical quantity calculated to determine whether or not the difference between two quantities is statistically significant or is owing to chance factors.

Daydreaming. Refers to the act of withdrawing into the imaginative world, or realm of fancy, usually to provide a more pleasant world than the real one. Fantasy.

Deductive reasoning. From the general to the particular, from the whole to its parts. Applying general principles to specific situations.

Defense mechanism. Refers to psychological processes practiced by those making poor adjustments in order to protect themselves from the forces and stimuli of life. Negativism and rationalization are examples of defense reactions.

Delinquent. A boy or girl whose behavior is antisocial.

Development. Change in character and quality accompanying growth. In psychology, most emphasis is placed on physical, mental, social, and emotional development.

Deviate. One who differs considerably from the normal, or average. Either a feeble-minded person or one of exceptional talents may be classified as a deviate.

Differential retention. Degrees of remembering for different types of material; some types are forgotten more rapidly than others.

Digit span. Determined by the largest number of digits a person can repeat without error after having heard or seen them once.

Discrete. Entirely separate and distinct. The opposite of continuous.

Disuse, the principle of. According to this principle, facts, knowledge, information, and skills that are not reviewed, practiced, or used are forgotten.

Ductless glands. Glands that give off their chemical or hormone directly into the blood stream. The thyroid, adrenals, pituitary, and others are ductless glands and make up the endocrine system.

Educational age. Same as subject-matter age. Determined by achievement in various subject matter tests such as in arithmetic, reading, etc. Norms or standards are in terms of average achievement according to chronological age.

Effect, principle of. A principle of learning: If the result is pleasant, the response to a stimulus is strengthened, but it is weakened if the result is not satisfying or is unpleasant.

Embryo. In the case of human beings, it is the child during the first three months of prenatal or intra-uterine life.

Emotion. A state of strong feeling. Emotion is accompanied by physiological reactions. Some of the more common emotions are joy, anger, fear, and grief.

Emotional adjustment. Effective control of the emotions and good emotional responses to the situations of life.

Empirical. Depending upon observation and experience. Founded upon experience or experiment.

Endocrine glands. The ductless glands, such as the thyroid, adrenals, and pituitary, whose secretions pass directly into the lymph or blood.

Enrichment. Extra activities and experiences provided for children so they can be educated to their capacity.

Enuresis. Inability to control adequately the passage of urine.

Escape mechanism. A term used in connection with mental health or mental hygiene. It refers to methods of escaping from reality by means of daydreaming, fantasy, and repressions.

Essay examination. An examination in which the answers are written out in paragraph or essay form.

Exercise, principle of. A principle of learning involving use and disuse: That which is used and practiced is learned, but that which is not used and practiced is forgotten.

Experimental group. The group that is subjected to special experimental conditions and is usually matched with a control group.

Extrovert. A person whose thoughts, energy, and behavior are directed to persons and things outside of self. The opposite of introvert.

Fantasy. Daydreaming, an imaginary world.

Feeble-minded. Specifically, those persons who have intelligence quotients under 70. In general the feeble-minded are those of such limited intelligence that they cannot deal adequately with typical or normal situations.

Feeling. Same as emotion, except that the feeling is not so strong or intense.

Fetus. In the case of human beings, it is the child during the fourth through the ninth month of prenatal or intra-uterine life.

Fontanelle. Soft spot, or opening, on the top of a baby's head. It usually closes at the age of about 18 months.

Fraternal twins. Two-egg twins. Developed from two germ cells (see Identical twins).

Free association. Refers to the process of responding to a given word with the first word that comes to mind.

Frustration. The state or condition of being baffled, balked, or thwarted when trying to satisfy ones desires or motives.

Gamma hypothesis of learning. One of Dunlap's principles of learning: A response to a stimulus does not influence the probability of that response's being evoked again by the same stimulus.

Generalization. The conceptional process of applying knowledge and principles acquired in one situation to another situation. The principle of generalization is employed to explain transfer of training.

Gestalt. The German school of psychology. Stress is laid on the organization, pattern, or configuration of the stimuli and response.

Gifted children. Very bright children. In much of the research on gifted children, those with I.Q.'s of 140 and over were considered as being gifted.

Gregariousness. Being together in groups. A desire to be with others.

Group test. A test that can be given to a number of persons at the same time.

Heterogeneous. Refers to classes or groups the members of which vary considerably in their characteristics. The opposite of homogeneous.

Heterozygous. Refers to germ cells that have heterogeneous determiners for various qualities.

Hierarchical. Pertaining to the organization of skills, habits, and concepts at levels ranging from the simple to the complex.

Homogeneous. Refers to classes or groups the members of which vary comparatively little in their characteristics. The opposite of heterogeneous.

Homozygous. Refers to germ cells that have like determiners for various qualities.

Hormone. A chemical secretion given off by the ductless, or endocrine, glands.

Hyperthyroidism. A physiological condition involving the overactivity of the thyroid gland.

Hypothyroidism. A physiological condition involving the underactivity of the thyroid gland.

Identical elements, transfer according to. According to this theory, transfer takes place to the extent that the elements in two situations are identical.

Identical twins. One-egg twins. Developed from the splitting of the single germ cell (see Fraternal twins).

Individual test. A test that can be given to only one person at a time.

Inductive reasoning. From specific to general, from part to the whole. Drawing conclusions or generalizing on the basis of specific observations, data, and evidence.

Inferiority complex. Thoughts of self are accompanied by feelings of inferiority. A person with an inferiority complex is often shy and lacks confidence in himself.

Insight. A sudden or quick conception of the meaningful relationship of the elements in a situation or problem.

Insulin. A chemical from the islands of Langerhans in the pancreas. Insulin promotes the utilization of sugar. It is also manufactured from the pancreas of sheep and oxen and used by diabetics.

Intelligence quotient. Obtained for a child by dividing his mental age by chronological age. It is the index of brightness and indicates the rate of mental growth. Mental ratio.

Internal secretion. The secretion, or chemical, given off by the ductless, or endocrine, glands.

Introspection. The mental process of looking into and examining one's own thoughts, feelings, and activities. Looking into one's own mind.

Introvert. A person whose thoughts and feelings are directed inward to himself. The opposite of extrovert.

Langerhans, islands of. The part of the pancreas that gives off insulin.

Maladjustment. Poor and ineffective reactions to the situations of life. Unsatisfactory behavior; a state of poor mental health. Not in harmony with the environment.

Malingering. Pretending or assuming illness to avoid or to escape from personal difficulties.

Malnutrition. Poor nutritional status.

Maturity. The period when and after maximum growth has been reached. State of full development.

Maze. Devices, instruments, or figures containing many pathways, or routes, and varying in complexity. The object is to find the most direct route from the beginning of the maze to the end. Mazes are used to test the abilities of both human beings and animals.

Mean. A measure of central tendency determined directly by dividing the sum of the scores or values by their number.

Median. A measure of central tendency. The median is the value above and below which there is an equal number of values when they have been arranged according to size.

Medullary sheath. The nerve fiber (axon, or dendrite) is surrounded by a fatty covering, which, in turn, is encased by an outside covering, or membrane, known as the neurolemma. A fiber so enclosed is said to be medullated; the medullary sheath consists of the neurolemma and the fatty sheath.

Memory span. The amount or extent that can be recalled or reproduced correctly after a single impression.

Mental age (M.A.). Determined by the use of mental, or intelligence, tests. The average score for children of any chronological age indicates mental level, or level of mental development.

Mental discipline. Training or disciplining the mind through the processes of study and intellectual activity. The qualities purported to be obtained thus are also purported to manifest themselves in any situation in which the mind is used.

Mental set. Mind set. Being disposed to attend to specific stimuli or to a given situation.

Metabolism. The building up and breaking down of living matter. Utilization of food by the body.

Mode. A measure of central tendency. It is the most common characteristic or the most frequent score or value.

Myxedema. Hypothyroidism in an adult.

Negativism. A mode of behavior in which a person tries to adjust to a situation by not responding or by doing the opposite of that which is suggested or required by the situation.

Neurological development. The development of the nervous system.

Neurotic. Maladjusted, unbalanced, disorganized.

New-type test. Short answer or objective test (see Objective test).

Nonsense syllable. A syllable that is not a word or a part of a word and has no established meaning.

Normal distribution. A symmetrical distribution that has definitely established statistical values. In a normal distribution, one standard deviation

above and below the mean includes 68.27 per cent of the scores or cases. Shown by a normal curve.

Norms. Standards or averages.

Objective. Free from bias or prejudice. When used with tests, it refers to those scored with key or machine, so that the personal element of the scorer is entirely removed.

Objective test. A test calling for short answers which can be scored objectively or unequivocably.

Oedipus complex. A complex in which the attachment of children for their parents of opposite sex is abnormally strong.

Ontogenetic. Growth and development of the individual from conception to death. Life history of the individual.

Optimum. The most favorable degree, amount, or condition.

Ovaries. The female reproductive organ in which the eggs are produced.

Overconcern. Worry, anxiety, fretfulness.

Overlearning. Learning beyond the point where the material is just learned. Thus, if a child can just barely recite an arithmetic table, overlearning consists in learning the table more thoroughly by spending more time on it.

Overprotection. A solicitude for the welfare of a person that is so extreme that he is shielded from too many of the forces and activities of life. Parents, who overprotect their children, shield them so much that the latter do not learn to cope with their environment.

Ovum. The female germ cell.

Part method. Learning a unit or lesson in parts. Contrasted with the whole method or learning by wholes.

Percentile. A score, or value, that has a definite position in a distribution on the basis of percentages. Thus, a value that is the 75th percentile has 75 per cent of the values below it and 25 per cent above.

Perception. Comprehending the meaning of stimuli. An awareness of sensory stimulation.

Phylogenetic. Race history from the simplest to the most complex. Evolution of the species from the single cell to man.

Physiological limit. The point at which performance cannot be exceeded because of the limit of the capacity of eyes, fingers, legs, or any other part of the body. Thus, the rate the eyes move sets a limit on the speed of reading, and the rate at which the fingers move sets a limit on the speed of typewriting.

Pineal. A small ductless gland in the brain whose secretion influences growth.

Plateau. That part of the learning curve that is flat and thus represents the period of no apparent progress.

Plus gestures. Certain types of behavior by a person that are designed to cause him to appear favorably in the eyes of others. Plus gestures are a substitute for a successful adjustment in life.

Pollyanna. An attitude or response to the effect that everything is for the

best; things could have been worse and therefore we should be pleased.
Same as sweet lemon.

Power. Refers to the power of the mind as determined by the complexity or difficulty of tasks that can be mastered when plenty of time is given; the factor of speed is minimized when power is tested.

Practical limit. The achievement reached by moderately strong but not extreme effort.

Primary learning. The learning of material or subject matter that constitutes the lesson at hand or the immediate objectives.

Projection. Attributing to others the weaknesses that are characteristic of oneself. Attributing to others one's own motives and complexes.

Psychiatrist. A specialist in mental diseases who is trained in medicine and has an M.D. degree.

Psychosis. Insanity, mental disease. Much more serious than the conditions described in this book in connection with mental health and mental hygiene.

Psychosomatic. Mind-body. Specifically refers to the influence of psychological factors on the health.

Puberty. Earliest age at which one can conceive children. The beginning of adolescence.

Quotient, accomplishment. Achievement age, such as reading age and geography age, divided by mental age.

Quotient, educational. Achievement age divided by chronological age.

Quotient, intelligence. Mental age divided by chronological age.

Rationalization. The process of giving logical and reasonable but untrue excuses. The reasons given are not true to the motives. The purpose is to deceive oneself and others in order to maintain a better status in the eyes of oneself and others.

Readiness, principle of. Being disposed to attend to stimuli or to respond; to do so is usually satisfying and not to do so is thwarting and dissatisfying.

Regression. Tendency to move toward the average.

Reliability. The accuracy of a test or measuring instrument. A reliable instrument gives the same results on any occasion under the same conditions.

Repression. Holding back, or pushing into the subconscious, certain feelings and ideas. One who bottles up, or keeps secret, many of his experiences, emotions, and ideas is said to repress them.

Retention, or memory. The opposite of forgetting.

Retroactive inhibition. The negative or erasing effects of a new experience on the learning of an earlier experience.

Sample, sampling. A part of the total that is representative of the total. A portion that has the characteristics of the whole. When it is impossible to study all of a group of children, for example, a number of them, or a sample, is selected carefully so that it will represent as closely as possible the total group.

Secondary sex characteristics. Refers to the masculine and feminine growth and development of voice, hair, and body shape. This growth is influenced by the endocrines.

Sensorimotor. Refers to response, or behavior, involving the senses, nerves, and parts of the body, such as the fingers, arms, and legs.

Short-answer test. The objective or new-type test (see Objective test).

Single variable. The one factor that is not equalized or matched. The factor whose effect or influence is being tested.

Socioeconomic. Referring to social and economic factors and conditions.

Sociogram. A diagram or chart which depicts certain social relationships that exist between members of a group.

Sociometrics. Methods of measuring the social relationships that exist between members of a group.

Sour grapes. A form of rationalization in which the person who fails to obtain his objectives states that they were not worth achieving anyway. In Aesop's fable the grapes, which represented the objective and were not obtained, were said to be "sour" by the fox.

Speed. The number of tasks of uniform but not very great difficulty that can be done in a fixed period determines speed of performance and is interpreted as indicating mental ability. Should be contrasted with power, which refers to the difficulty of the task that can be accomplished when plenty of time is allowed.

Sperm. The male germ cell.

Standard deviation. A measure of variability; the distance above and below the mean that includes 68.27 per cent of the cases or scores.

Standardized test. A test for which norms, or standards, have been established. It has been used to determine the exact performance for persons of given ages and in some cases for a given grade.

Superiority complex. A complex characteristic of a person whose feelings about self are that he is superior to others. Such a complex in a desirable form is equivalent to healthy confidence; but in its undesirable form, it represents compensation for inferiority.

Sweet lemon. Same as Pollyanna.

Teens. The ages thirteen to nineteen inclusive. Corresponds closely to the period of adolescence.

Temper tantrum. A fit of temper indulged in to obtain one's way. Children often throw themselves on the floor and kick, scream, and hold their breath in order to get what they want.

Thymus. A gland located in the lower part of the throat. It reaches its highest development at about the age of fifteen and gradually atrophies after that age. Its function is not satisfactorily understood.

Thyroid. A very important ductless gland located in the neck close to the larynx.

Thyroxin. A secretion given off by the thyroid. A deficiency or excess of this chemical seriously affects health and personality.

Torso. The body exclusive of head, arms, and legs.

Transfer. Learning through recognition, use, and application of knowledge, skills and habits for a given situation that were learned in another situation.

Unreliability. Not possessing reliability (see Reliability).

Use, principle of. A principle of learning; knowledge and skills that are used are strengthened and retained. Correspondingly, the retention of that which is not used is weakened.

Validity. Term used with reference to tests and measurements. Tests have validity if they measure what they are intended to measure. Thus, an intelligence test has validity if it measures true intelligence and not schooling and other advantages.

Variability. The range, spread, and heterogeneity of scores, values, and characteristics. Variability is described by a number of statistical quantities.

Viscera. The internal organs in the cavity of the body, such as the stomach, heart, intestines, and liver. They are very important emotionally.

Whole method. Learning by wholes, such as learning a poem or a musical selection as a whole or as a unit. Contrasted with learning by parts or sections or by the part method.

Worry. Overconcern and care about the past, the present, or the future. Concern that is fretful and troublesome.

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